SPECIAL { DUTIES AND COMPENSATION OF MUNICIPAL ENGINEERS—BY ALMON D. THOMPSON, C. E.

Vol. XVI. January, 1899. No. 1.

PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

PUBLISHED BY
MUNICIPAL ENGINEERING COMPANY
INDIANAPOLIS NEW YORK

LIBRARY OF CONGRESS
FEB 7 1902

Two Dollars Per Year. Single Copies, 20 Cents.

ASPHALT PAVEMENTS

THE BARBER ASPHALT PAVING COMPANY

BOWLING GREEN BUILDING
11 BROADWAY, NEW YORK

Highest Awards Received at World's Fair, 1893.

1st—ASPHALT AND ASPHALTIC CEMENTS:

"The Refined Asphalt and Asphaltic Cements for Pavements and Asphaltic Mastics are of excellent quality and up to the required standard. They are therefore worthy of an award."

2d—TRINIDAD ASPHALT PAVEMENTS:

"The Trinidad Asphalt Pavements for streets, laid according to the several methods by 'The Barber Asphalt Paving Company' upon concrete foundations, old stone block and other pavements, are adapted to all climates. They are remarkable for quantity, quality, ease of traction, noiselessness, ease of cleaning, sanitary value, economy of maintenance and handsome appearance, and are worthy of an award."

3d—MACHINERY AND PROCESSES:

"The models, samples, etc., show clearly and fully the Machinery, Processes and Materials for the manufacture of Asphalt Pavements and Mastics. They are worthy of an award."

Municipal Engineering

VOLUME XVI. JANUARY, EIGHTEEN NINETY-NINE. NUMBER 1.

THE DUTIES AND COMPENSATIONS OF MUNICIPAL ENGINEERS.

By A. D. Thompson, City Engineer, Peoria, Ill.

The official census of the United States shows that in 1870 there was 20.93 per cent. of the total population living in cities; in 1880 there was 22.57 per cent., while in 1890 the urban population had increased to 29.12 per cent. From data in the possession of the writer a conservative estimate would place the population living in cities of the United States in 1898, as about 35 per cent. of the total or an increase of 75 per cent. in twenty-eight years. This enormously rapid growth of American cities has developed new and seriously complicated sanitary and engineering problems, and has created conditions under which the sanitary provisions and facilities for the conduct of business, as originally designed, are wholly inadequate. Public appreciation of the necessity of applying scientific principles to the design and business methods to the construction and maintenance of public works has grown rapidly during the past decade, until there is now a strong current of public opinion, requiring that these questions upon which depend the life, health and prosperity of each member of the community shall be no longer neglected or left to the political favorite, surveyor or self-styled engineer for a haphazard betterment, but that they be placed in the hands of men specially trained by education and experience for such work. The natural result of these conditions has been the development of municipal engineering as a new engineering specialty, the importance of which has been recognized by the adoption of particular courses of instruction by the principal technical educational institutions of the United States.

The necessity for specially trained men for municipal engineering must be readily admitted, after a consideration of the manifold duties required of such officers. The railroad, bridge, water-works engineer, or the follower of any of the older engineering specialties, must possess a thorough practical and theoretical knowledge of every detail of his particular line of work; but the engineer, who is fitted to fill the position of city engineer in cities of the United States, must have an intimate knowledge of all branches of civil engineering, and must possess a fair knowledge of electrical and mechanical engineering.

The following is a partial enumeration of the most important subjects, covered by the duties required of the engineer by the principal municipalities of the United States:

1. Sewers.
   a. Design.

Separate and combined systems, storm-water, house sewage, flushing, ventilation, kind of materials, manholes, flush-tanks, lamp-holes.

b. Construction.
Trenching, tunneling, bracing, pipe and brick laying, refilling.

c. Sewage Disposal.
Discharge in stream, chemical precipitation, filtration, coke breeze, septic tank.

d. Maintenance.
Repairs, cleaning.

2. Pavements.
   a. Characteristics of each and adaptability to different conditions.
   b. Foundation.
      Sand, gravel. concrete, plank.
   c. Filler for all above pavements, except asphalt, sand, tar, cement.
   d. Asphalt.
      Sheet or block, thickness, mixture, ingredients, kinds, binder.
   e. Maintenance.
      Sweeping, sprinkling, cleaning, repairs, renewals.
3. Good Roads.
   Macadam, telford-macadam, gravel.
   a. Construction and maintenance.
4. Streets.
   Grading, drainage, sprinkling, guttering, curbing.
5. Sidewalks.
   Cement, brick, tar, wood.
   a. Construction and Maintenance.
6. Street Railways.
   a. Cable.
   b. Electric.
      Overhead or underground trolley electrolysis, power, rails.
7. Street Lighting.
   Gas, electricity.
8. Conduits.
   Cable, telephone, electric lighting, steam.
9. Railroads.
   Location, grade, paving, sidetracks, track elevation.
10. Water-works.
    a. Water supply.
       Amount, collection, purification, storage, reservoirs, stand-pipes.
    b. Distribution System.
       Pumps, boilers, pipes, hydrants, meters.
11. Construction Materials.
    Strength of wood, iron, steel, cement, stone, brick, testing materials.
12. Bridges.
    Railroad and wagon.
    Design, inspection, repairs.
13. Surveying.
    Locating lots, opening streets, damage suits, location and grade for curb, sidewalks, buildings, streets and pavements.
14. Map-making.
    Maps of sewers, water-works, gas and heating systems and appurtenances. Assessment maps, service pipes, pole lines.
15. Garbage.
    a. Collection.
    b. Disposal.
       Dumping on waste land or other places, incineration, utilization.
16. Parks.
    Drives, design of system, maintenance.
17. Plumbing.
    Piping, traps, ventilation, fixtures.
18. Buildings.
    Examination of public buildings, condemnation of old and unsafe structures.
19. Judicial.
    Member of various boards, such as public works, plumbing, electric wiring, etc.
20. Law.
    Contracts, ordinances, specifications and an intimate knowledge of the laws governing same, sanitary acts, special assessment laws.
21. Clerical.
    Making assessment rolls for improvements, filing records, auditing bills, book-keeping.
22. Estimates.
    Estimating cost of proposed public works, city repairs, monthly contracts, etc.
23. Reports.
    Annual, special to committees, progress.

In the largest cities the duties above designated are divided among several departments, but the cases are very rare where such a method prevails in cities having a population less than 400,000, and there are but six cities in the United States with a population above this figure, according to the census of 1890. The water-works, electric and gas lighting, street railways and many other municipal necessities, may be under the control of private corporations, but the close business relations and the constant intercourse between these corporations and the municipality, requires the engineer as official adviser of the latter to be as well posted as though in direct charge.

The varied non-professional du-

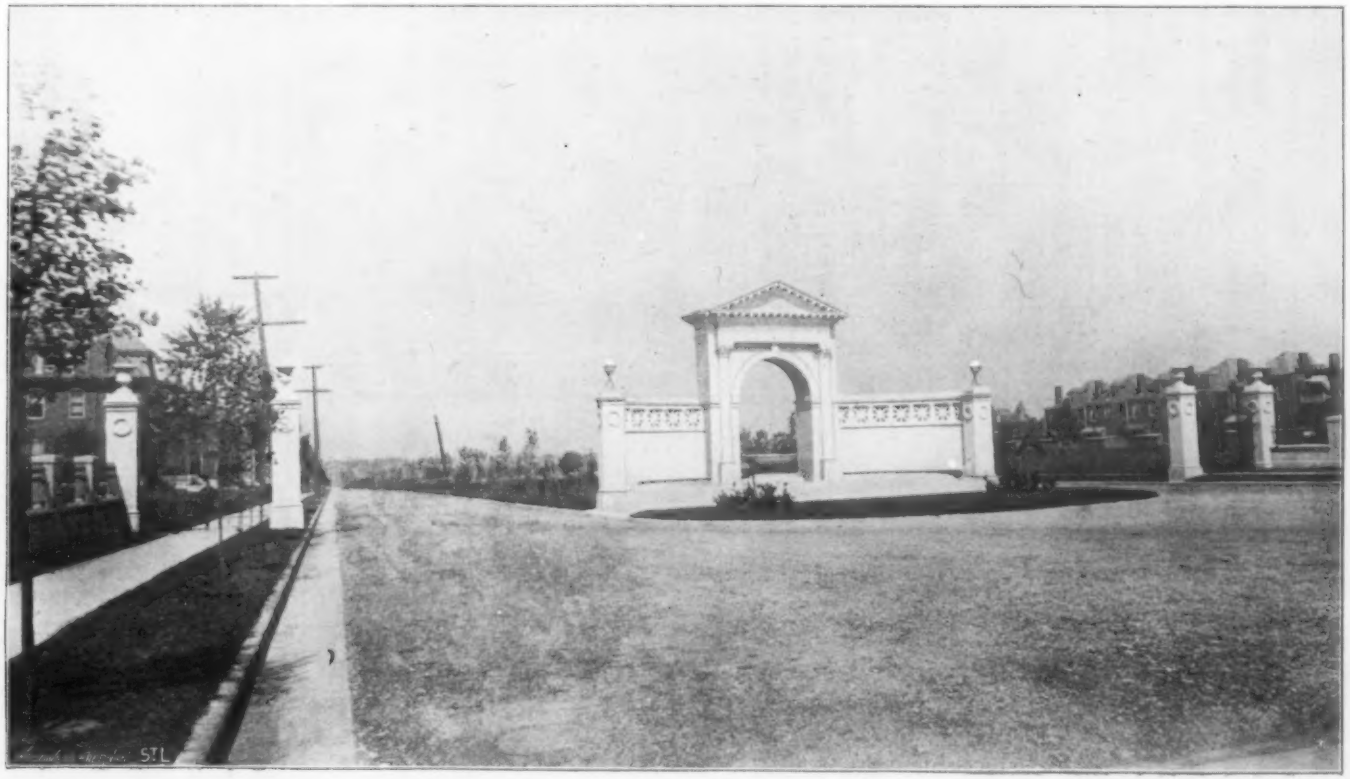
MARKET STREET, NEAR UNION STATION, ST. LOUIS, PAVED WITH GRANITE.

ties that may fall to the city engineer is well illustrated by an instance where the engineer was detailed to determine the best class of elevator for use in a public building. Again, a technical paper in a recent issue notes the appointment of a city engineer in a Pennsylvania city, on a board to devise ways and means to abate the smoke nuisance. An engineer in a city of about 100,000, writes as follows concerning his duties: "The employes in the city engineer's office have a great deal of work thrown on them in connection with assessments, perhaps half of the work of the office is of this nature." The engineer of another city having 68,000 inhabitants, reports duties outside of engineering as follows: "The city engineer's department has charge of making assessments for local improvements, audits all miscellaneous accounts, gives orders for all supplies and performs numerous other duties not required in other cities."

It may be stated, therefore, that the successful municipal engineer must be an expert sanitary and water-works engineer and surveyor; a good railroad and bridge engineer; a fair electrician and mechanical engineer; a tactful, level-headed man of business, and be well versed in law and legal forms.

These requirements demand considerable ability with the most thorough preparation, knowledge and experience, and the remuneration should be in accordance therewith. The custom with a majority of cities is to pay the minimum amount that will secure a man for the position, and this plan has necessarily resulted in errors costly to the municipalities and the engineering profession. The popular idea that the amount of public work designed and superintended is a criterion by which to judge of the ability and exertion of the engineer is a fallacious and misleading proposition. The public improvements constructed vary largely each year, and their design and superintendence is ordinarily a relatively simple matter compared with the problems of maintenance of municipal works, under unforeseen and constantly varying conditions. The same rule does not apply to the engineer of a city or corporation which does to architects and engineers for works where the responsibility ceases upon the completion of the work in hand.

The writer has attempted to obtain statistics regarding the salaries paid to city engineers of the principal cities of the United States, and determine, if possible, the prevailing basis for same. Letters of inquiry were sent to the engineers of all cities in the United States having a population of not less than 20,000, nor more than 300,000, according to the census of 1890, or 400,000 estimated in 1898, to determine the salaries paid out, and the amount of public work performed during 1897. The results have been tabulated and are given herewith. The minimum limit was taken because generally the cities of smaller size employ a local surveyor at a small sum to perform the work required, who can not be classed as a fair example of the engineer under consideration. The maximum size includes practically all the large cities employing a city engineer. In cities larger than this the immense volume of business requires the formation of departments, with an engineer at the head of each. The object was to secure data from the entire field of American cities where the trained municipal engineer, of the type described



FLORA AVENUE, ST. LOUIS—TELFORD PAVEMENT.

above, is employed. In order to determine the relation, if any, between the population, salary, amount of public work, and the expense of the engineering department, it was necessary to divide the cities into classes, and thus obtain average results. This was done by including in the first group, or "class G," all cities from

table reveals the fallacy of attempting to regulate the salary of the engineer, or the amount expended by his department, by the cost of the public work superintended. Many of the smaller cities constructed, during the period cited, more public improvement than the larger places.

As an instance, the cost of pub-

TABLE OF STATISTICS REGARDING ENGINEERING & PUBLIC WORK IN 97 CITIES OF THE UNITED STATES.

COMPILED FROM DATA FURNISHED BY CITY ENGINEERS, BY A. D. THOMPSON, CITY ENGINEER, PEORIA, ILL. NOVEMBER, 1890.

City	Estimated Population 1890	Public Work Constructed in 1889		Salary of City Engineer		Expense Engineers Department	
		Amount	Per Cent.	Amount	Per Cent.	Amount	Per Cent.
CLASS A. Population 400,000–2,213,000							
Cleveland, O.	325,000	$1,424,243	.438	$4,000	.0012	$22,516	$0.007
Buffalo, N.Y.	253,000	890,981	.353	3,000	.0008	332.15	0.133
Cincinnati, O.	283,000	1,323,215	.346	4,000	.0010	53,184	0.188
Washington, D.C.	180,000	1,111,100	6.17	—	—	59,506	0.330
Detroit, Mich.	216,000	836,263	.304	3,000	.0011	19,203	0.089
New Orleans, La.	218,000	262,010	.184	4,000	.0018	20,000	0.093
Average	332,500	$ 858,136	.304	$ 3,800	.0011	$ 31,583	0.134
CLASS B. Population 210,000–180,000							
Milwaukee, Wis.	255,000	1,351,084	.534	4,000	.0012	28,978	0.101
Newark, N.J.	220,000	—	—	4,000	.0018	20,000	0.091
Minneapolis, Minn.	210,000	1,000,000	4.76	4,000	.0020	12,000	0.133
Kansas City, Mo.	200,000	1,000,000	.500	3,150	.0015	20,000	0.100
Indianapolis, Ind.	190,000	379,081	.305	2,500	.0013	13,500	0.070
Average	215,000	$ 1,151,036	.535	$ 3,530	.0016	$ 24,516	$ 0.111
CLASS C. Population 180,000–121,000							
Rochester, N.Y.	175,000	410,084	.234	3,000	.0017	18,820	0.107
Providence, R.I.	168,000	1,179,363	7.02	4,000	.0023	62,571	0.373
Omaha, Neb.	158,000	1,800,000	1.30	3,000	.0018	12,000	0.080
St. Paul, Minn.	150,000	438,903	.292	3,000	.0033	22,413	0.150
Columbus, O.	145,000	1,071,046	.915	2,200	.0016	18,653	0.116
Average	159,000	$ 1,179,318	.740	$ 3,400	.0022	$ 18,448	$ 0.165
CLASS D. Population 121,000–81,000							
Syracuse, N.Y.	120,000	488,000	.313	3,000	.0035	23,000	0.191
Toledo, O.	120,000	1,961,144	1.63	2,500	.0020	21,451	0.180
New Haven, Ct.	115,000	460,000	.384	2,000	.0023	11,380	0.103
Scranton, Pa.	105,000	800,000	.317	2,500	.0019	9,610	0.091
Fall River, Mass.	101,000	311,000	.308	3,000	.0038	13,333	0.132
Albany, N.Y.	100,000	290,000	.290	3,250	.0032	12,012	0.121
Atlanta, Ga.	100,000	1,800,000	7.50	3,000	.0030	7,000	0.070
Grand Rapids, Mich.	100,000	245,126	.245	2,400	.0024	8,515	0.085
Paterson, N.J.	100,000	30,000	.030	2,200	.0022	2,000	0.020
Richmond, Va.	100,000	—	—	4,000	.0040	3,500	0.035
Nashville, Tenn.	90,000	183,000	.172	2,000	.0022	8,000	0.074
Cambridge, Mass.	87,000	—	—	3,000	.0034	13,000	0.133
Lowell, Mass.	84,000	188,000	.241	2,700	.0032	15,000	0.192
Average	101,000	$ 539,900	.533	$ 2,815	.0028	$ 11,827	$ 0.116
CLASS E. Population 81,000–54,000							
Hartford, Ct.	71,000	264,350	.343	3,000	.0038	3,414	0.133
Reading, Pa.	70,000	342,200	.470	2,500	.0036	11,333	0.151
Camden, N.J.	70,000	527,000	.781	2,000	.0028	4,100	0.058
Trenton, N.J.	70,000	150,000	.230	3,000	.0043	7,044	0.100
Wilmington, Del.	70,000	300,000	.428	2,000	.0028	3,000	0.130
Troy, N.Y.	68,000	300,000	.441	2,000	.0029	7,500	0.110
Houston, Tex.	68,000	1,853,552	2.72	1,800	.0021	10,998	0.160
Bridgeport, Ct.	65,000	225,000	.346	Fees	—	1,200	0.018
Peoria, Ill.	63,000	351,118	.548	2,000	.0031	6,338	0.101
Charleston, S.C.	60,000	88,000	.113	1,800	.0030	3,000	0.050
Manchester, N.H.	56,000	153,000	.268	1,200	.0020	2,000	0.036
New Bedford, Mass.	54,000	—	—	2,500	.0041	8,400	0.140
Salt Lake City, Utah	53,000	250,000	.238	2,000	.0032	6,531	0.103
San Antonio, Tex.	Below	—	—	2,000	.0051	—	—
Seattle, Wash.	50,000	48,000	.081	1,800	.0030	3,837	0.114
Somerville, Mass.	50,000	150,000	.250	2,500	.0035	3,200	0.101
Utica, N.Y.	50,000	150,000	.238	2,000	.0034	753.18	0.016
CLASS E. Continued.							
Erie, Pa.	27,000	102,000	.510	—	—	2,040	0.151
Hoboken, N.J.	53,000	120,000	.233	Fees	Fees	—	—
Lawrence, Mass.	53,000	152,000	.278	2,200	.0040	2,205	0.108
Average	53,515	$ 126,331	.300	$ 1,187	.0034	$ 2,018	$ 0.139
CLASS F. Population 54,000–36,000							
Springfield, Mass.	53,000	207,200	.331	1800	.0034	8,100	0.153
Wilkesbarre, Pa.	51,000	190,000	.152	2,800	.0055	5,500	0.108
Augusta, Ga.	50,000	73,500	.120	2,500	.0050	4,175	0.083
Binghamton, N.Y.	50,000	107,311	.215	2,500	.0050	5,630	0.113
Dubuque, Ia.	50,000	255,614	.431	2,400	.0048	3,650	0.113
Duluth, Minn.	50,000	557,340	11.16	2,200	.0044	11,355	0.227
Harrisburg, Pa.	50,000	—	—	1,800	.0030	5,000	0.100
Knoxville, Tenn.	50,000	—	—	1,800	.0030	2,500	0.050
Fort Wayne, Ind.	48,000	148,500	0.38	2,000	.0042	3,183	0.066
Saginaw, Mich.	48,000	30,000	.126	1,800	.0035	3,600	0.074
Covington, Ky.	45,000	30,053	.065	1,800	.0040	2,100	0.042
Holyoke, Mass.	45,000	122,428	.275	2,500	.0055	8,350	0.180
Kansas City, Kan.	45,000	86,200	.193	2,000	.0044	4,660	0.103
Springfield, Ill.	44,500	30,000	.068	1,200	.0027	2,250	0.052
Quincy, Ill.	43,000	112,000	.250	1,200	.0035	2,700	0.063
Altoona, Pa.	42,000	—	—	2,000	.0047	6,310	0.158
Portland, Me.	41,000	233,000	.570	2,400	.0058	7,020	0.171
Lancaster, Pa.	40,000	30,000	.075	2,000	.0050	3,000	0.075
Salem, Mass.	40,000	27,811	.142	1,500	.0037	3,000	0.075
Springfield, O.	40,000	72,000	.187	1,500	.0040	3,500	0.087
Elmira, N.Y.	38,000	40,000	.105	1,500	.0042	4,500	0.118
South Bend, Ind.	38,000	156,455	4.21	2,000	.0053	5,500	0.140
Wheeling, W.Va.	38,000	82,000	1.45	2,500	.0066	4,460	0.118
Rockford, Ill.	36,000	88,000	2.41	1,200	.0034	2,500	0.073
Average	44,350	$ 108,118	.344	$ 1,950	.0042	$ 4,582	$ 0.104
CLASS G. Population 36,000–24,000							
Brockton, Mass.	32,000	130,000	.425	1500	.0043	7,000	0.200
Haverhill, Mass.	35,900	57,148	.164	1850	.0038	2,750	0.080
Joliet, Ill.	32,000	81,000	2.51	1250	.0035	3,400	0.097
La Crosse, Wis.	32,000	22,000	.083	1200	.0034	3,426	0.098
Little Rock, Ark.	32,000	—	—	1500	.0043	1,500	0.081
Pawtucket, R.I.	32,000	174,003	.435	2,200	.0070	3,355	0.226
Sacramento, Cal.	32,000	77,000	2.22	Fees	Fees	—	—
Tacoma, Wash.	32,000	24,000	.085	1,000	.0028	1,400	0.046
Waterbury, Ct.	32,000	60,000	1.71	2,200	.0078	5,200	0.177
Sioux City, Ia.	33,000	150,000	4.85	1565	.0053	3,200	0.097
Springfield, Mo.	31,000	60,000	1.81	1200	.0037	2,000	0.062
Burlington, Ia.	30,000	45,000	1.50	1500	.0058	2,000	0.067
Chattanooga, Tenn.	30,000	33,000	1.10	1500	.0050	2,426	0.083
Montgomery, Ala.	30,000	102,000	4.13	2,100	.0078	3,326	0.184
Newport, Ky.	30,000	31,000	1.05	1800	.0060	2,203	0.076
Zanesville, O.	30,000	41,000	1.37	800	.0027	1,800	0.051
Newton, Mass.	28,000	225,000	16.18	3,000	0.108	17,852	0.611
Fitchburg, Mass.	28,500	44,000	1.83	1200	.0043	3518	0.113
Taunton, Mass.	27,000	36,000	1.11	1200	.0052	2,500	0.081
Hamtramck, Mich.	26,000	150,000	5.71	1,000	.0051	3,500	0.150
Bangor, Me.	25,000	13,000	.780	1250	.0065	2,600	0.130
Woonsocket, R.I.	15,000	102,000	4.35	2,000	.0080	6,000	0.266
Nashua, N.H.	14,000	3,000	.081	1,200	.0080	3,200	0.133
New Albany, Ind.	14,000	14,000	1.04	1452	.0078	2,265	0.058
Average	30,710	$ 80,181	2.32	$ 1,581	.0062	$ 4,233	$ 0.150

24,000, the minimum size, to 36,000, the largest city having a population of fifty per cent. greater than the smallest. Each class is a continuation of the plan, or, in other words, the upper limit of each group includes all cities up to those with a population fifty per cent. greater than the smallest city within it.

A superficial examination of the

lic work in a city with a population of 275,000 amounted to $505,020, while the public work constructed in a city of 50,000 amounted to $557,340. If the engineer in a smaller place was paid for the work superintended at the same rate as the salary in the larger place figures, he should have been paid $4,414 for his services.

Every portion of the municipal

engineer's duties in design, construction or maintenance has an intimate bearing upon the physical, moral and material welfare of the community. These interests are directly dependent upon a pure, plentiful supply of water for consumption and fire protection, sanitary sewerage systems of sufficient capacity, clean, sanitary pavements, healthful and inoffensive disposal of sewage and all refuse, and safe bridge, elevated railway, viaduct and tunnel construction. These items become more numerous and complicated with the increase in population and the growth of the business interests. Since the population of a city determines, in a large measure, the amount of work and the ability required of the municipal engineer, it is proper that his remuneration should ordinarily be regulated by a sliding scale of a per capita tax. The table accompanying this article shows a fairly regular decrease in the average per capita expense for engineer's salary from group "G" to group "A," but there is nothing to indicate a systematic basis for the determination of this item. The recompense for municipal engineers paid by the cities of the United States listed in this table is, with a few exceptions, sadly deficient compared with the remuneration realized in other professions requiring no greater preparation or ability to practice successfully.

A REVIEW OF IMPORTANT MUNICIPAL WORK IN AMERICA.

One of the interesting papers read at the recent annual meeting of the American Society of Municipal Improvements in Washington was a review of all new matters of importance reported upon by municipal officials throughout the country. This was submitted by Mr. George H. Benzenberg, C. E., of Milwaukee, chairman of the committee on review. One of the difficulties encountered in gathering information from official reports is that, as stated by Mr. Benzenberg, the official for one or all of many reasons fails to report upon interesting work, confining himself almost exclusively to tabulated statements of such data as the local or general laws require to be made. "Very few reports," he says, "contain either descriptive information or illustrations of municipal work and improvements, which do so much towards making these documents so valuable and instructive to all readers, whether at home or abroad. This is so undoubtedly because these reports, when written, are supposed to be made to local constituencies only, and not for general distribution among students of municipal improvements, who are more interested in the progress made in various cities towards the solution of these civic problems, than in the statistical columns submitted, not but that the latter are necessary, but that they are made more interesting and valuable by the addition of explicit and descriptive statements and illustrations. The committee therefore appeals to all the heads of various departments of municipal improvements to enlarge in their annual reports upon any work which has been executed, especially where difficulties were encountered in connection therewith, and also upon any changes in methods, management or legislation which may have been

introduced and which relate to public betterments."

In order to obtain the necessary data for the report, a circular letter was sent by the committee on review to eighty-five leading cities, with a request for information relating to any new work, method or legislation during the past year. Replies were received from about one-third of the number addressed, many of them containing much desired information, which is set forth below.

NEW LEGISLATION.

From the replies and reports received it is apparent that in many states greater facilities for further improvement of streets is granted to municipalities by legislative acts and by amendments thereto, permitting cities to lend their credit for the benefit of individual property holders, by the issue of bonds which are to be repaid by a special tax levied annually against the property directly benefited by such improvements, for a period of from five to sixty years.

In some states the authority of determining the necessity of improving streets under such act is placed in a special board or commission appointed by the mayor for that purpose.

Mr. E. W. Boynton, of Davenport, writes that in October, 1897, the state of Iowa adopted a new code providing that each city must be divided into not less than three districts, and that a tax of five mills on the dollar on all taxable property is to be levied for the purpose of improving streets. He also states that the law permits property owners to pay for permanent improvements in ten equal annual installments with interest thereon, but that no improvement is assessed against any abutting owner until all of the work is completed, thus doing away with the necessity of any rebate in case the work should cost less than estimated.

Mr. George W. Tillsen, of Brooklyn, transmitted abstracts of certain special laws designed to make the payment of taxes in certain cases of street improvements easy. One act provides for the sale of certificates of indebtedness of the city of Brooklyn to an amount not to exceed $500,000 with which to pay for street work when completed, the amounts to be refunded by the property benefited, in five equal annual installments.

A similar act was passed to provide funds for the payment of a large amount of grading necessary to bring certain streets in a very rough part of the city to grade. These funds were to be returned by a special annual tax levied upon the property benefited for a period of ten years.

He also reported another and very remarkable law which authorized the issue of five series of bonds of $100,000 each to cover the cost of certain street work. These bonds were to be payable in fifty annual installments, the first to become due in not less than ten nor more than eleven years from date of issue, the installments to be paid by a special tax laid annually upon the property benefited. The first tax will not be due until ten years, and the last not until sixty years after the street work has been completed.

Mr. A. D. Thompson, city engineer of Peoria, Ill., reported, in abstract, a new law of Illinois, which went into effect July 1, 1897, applicable to improvements payable wholly, or in part, by special assessment or special tax. The act creates a special board of five members, with whom all such improvements must originate, and provides

in detail a slow and cumbrous method of procedure and of serving repeated individual notices upon every property-owner interested, as to every step that is taken in the lengthy proceedings of notice, of cost, of assessment, of court-hearing, of a possible reassessment and a possible rehearing. This act requires that, upon the award of contract, seventy-five days after confirmation of the assessment, notice of such award shall be posted for five days and advertised in daily newspapers for at least two days. It also provides that the owners of a majority of the property fronting on such street may, within ten days after the award, take and do said work at 10 per cent. less than the price at which it was awarded. This law is reported as being cumbersome, complicated and unsatisfactory.

Mr. A. Rosewater, city engineer of Omaha, reports: "Under our system the board of public works receives bids for all classes of pavements before the filing of petitions designating the material on the part of the property-owners. In this manner brick, stone and the various classes of asphalt are all brought into competition with each other, and the property-owners are enabled to act more judiciously than otherwise."

Mr. J. Griggs, chief engineer of Columbus, Ohio, reports a law passed by the general assembly of that state last winter for cleaning, sweeping, sprinkling and repairing streets in cities of the first grade in the second class which contains a new feature. It provides that before any such work is ordered, the board of public works shall appoint in every case for one year two electors, owners of real estate fronting on such street, avenue or alley, who, with the chief engineer, shall constitute a board of commissioners for such highway. This board is required within ten days thereafter to file with the board of public works a written statement of the cleaning, sweeping, sprinkling or repairing that is necessary to be done on such highway during the ensuing year, and thereupon the

FILLING DEPRESSIONS IN MACADAM WITH BITUMINOUS CONCRETE IN NEW YORK CITY.

board of public works is to prepare specifications and let a contract or contracts for such work, the entire cost of which is assessed equally by the foot upon all the land fronting such street between the points named in the contract, excepting, whenever there is a street railway operated on such street, the company so operating shall pay its share of the expense in the proportion which the part of said street occupied by the track of said railway bears to the whole surface of such street, the balance of such cost and expense to be equally assessed upon the property fronting said street.

In the city of Boston the authority to lay out, open and improve highways is by special act vested in a commision of three able and discreet men who are appointed by the mayor. This board has the authority to locate highways and determine the nature of the improvement, kind of pavement, the grades, sizes and material for sewers, catch-basins and all connections, and the sizes of water and gas mains and their connections. The cost of such improvements is paid for from funds derived from the sale of city bonds, which is repaid with interest to the city by the owners of the several parcels of land benefited according to the number of square feet contained in such parcel of land lying within one hundred and twenty feet of such highway, said repayments to be made entire within ten years.

To pay the expenses incurred in laying out and constructing four avenues projected under the above act a subsequent act was passed directing the city treasurer of Boston to sell bonds to an amount not exceeding $2,500,000.

Another act passed last May authorizes the city of Boston to issue bonds, notes or scrip to the amount of $500,000 for the purpose of establishing a comprehensive system of play grounds to meet the wants of the different sections of the city, not exceeding twenty in number. This undoubtedly is the first enactment for such liberal and humane purposes in this country, worthy of being emulated by others.

Boston has also by ordinance established a separate and distinct department of baths placed in charge of a board of seven members, two of whom shall be women. This board is authorized to establish and to have the care and custody of all bath houses, gymnasia and of all urinals or public convenience stations maintained by the city. This seems also a worthy departure which will undoubtedly insure greater attention to this branch of public comfort in a large city like Boston.

MUNICIPAL WORK.

Very little indeed that is new or novel has been reported in the method of doing or specifying municipal work. Naturally the conditions, the materials used or the magnitude of the work or improvements vary with each city, but the manner in which such work is specified to be done does not generally differ. There are some exceptions, however, as, for instance, the different foundations for asphalt pavements provided for under the many classifications of the Omaha specifications, which, in their variety, approach the experimental stage in character. Upon the results of one of these modifications, Mr. Rosewater writes that "the repavement of asphalt streets upon broken stone over old concrete where formerly wooden blocks were laid, has been accompanied with good results. The only objection-

MUSIC PAVILION IN FOREST PARK, ST. LOUIS.

able feature is the difficulty of securing as smooth surface over broken stone as is secured on concrete. On a mile and one-third length of such pavement laid last year and exposed to 18° F. (below zero) last winter no cracks have as yet appeared. This pavement had the concrete, adjoining curbs, for a width of nine inches broken and replaced with broken stone connected at inlet for subdrainage."

In his annual report for 1897, Mr. Rosewater assigns three leading causes for the appearance of cracks in asphalt pavements: first, the tendency of concrete to shrink within the first six months; second, the contraction and expansion of the concrete base incident to extremes of temperature; third, the upheaving influences of retentive soils containing moisture when exposed to freezing, thereby cracking the concrete and with it the asphalt. He then presents at length, to support the first two propositions, an extract from a paper by G. R. Stracham, A. M. Inst. C. E., read before the Association of Municipal and Sanitary Engineers at Leicester, England, July, 1887. This paper demonstrates the fact that the cracks in the asphalt are due to the cracks in the concrete base and cites many cases where examinations exhibited that fact. It then refers to many experiments that were made with the object of preventing the cracking of the asphalt in case where the concrete base contracted sufficient to cause cracking, and contains this conclusion: "From this it would appear that the principle of a material between the concrete and the compressed asphalt which will absorb the effects of the movements of the concrete is a correct one, and the writer invites the members of the association to experiment on cheapening the method." Undoubtedly the reason for the absence of cracks in this pavement at Omaha is the fact that this layer of broken stone serves as the medium between the asphalt and the concrete to absorb the movement of the latter when contracting instead of its acting as a layer affording drainage, especially when there is no necessity for drainage in that part of the pavement.

Mr. Thompson, of Peoria, reported that the indications are favorable to the success of the experiment he made of cutting or separating the asphalt to prevent cracking though but one winter has passed over the work. He separated the asphalt from curb to curb at intervals of 50 feet and of 100 feet by cutting the same to the concrete with an ordinary trowel after the asphalt had been compacted with the hand roller, filling the cut with dry cement and then compressing the whole with a steam roller.

Captain Lansing H. Beach, Engineer Commissioner, District of Columbia, presented information as to the practice in the District to prevent formation of cracks in concrete sidewalks. He writes that the use of broken stone in cement sidewalk work has been abandoned, substituting instead gravel entirely, "on account of the greater ease in cutting joints and the consequent better joint with less disturbance of the concrete in the block." The specifications for a concrete sidewalk without frost base provides for a layer of cement concrete four inches in thickness, overlaid with a layer of cement mortar one inch in thickness covered by a thin dry surface coat. Specifications for sidewalk with frost base provide for a layer of medium-sized gravel six inches

thick as a bed for the concrete. The cement concrete consists of one volume of Portland cement, two volumes of clean sharp sand and five volumes of small to medium sized gravel. The concrete is spread and thoroughly compacted to a depth of four inches by ramming, when the slab or flag divisions are marked off and markings cut three inches deep, the space made by the cutting tool to be immediately filled with dry sand and well rammed. The cement mortar to a depth of one half inch immediately over the markings made in the concrete. The slabs are then rolled with a toothed roller, leaving one inch margins.

Captain Beach also reports that he has "tried an experiment of rolling out the inequalities of an asphalt pavement with a heavy steam roller upon a day when the asphalt was so softened by the heat as to take the impressions of horses hoofs;" the result, however, was not satisfactory.

GRADING A MACADAM PAVEMENT FOR BINDER COURSE IN NEW YORK CITY.

coat consists of two volumes of Portland cement and three volumes of clean sharp sand. The same when mixed is spread to a thickness of one inch upon the concrete base while the latter is still soft and adhesive, when it is to be levelled off and beaten with wooden battens, so as to break any air cells and make the surfacing perfectly solid and at the true grade. A coating of dry cement and fine sand in equal proportions, by volume, thoroughly mixed, is then floated into the layer, when, after smoothing, the slabs are marked

Mr. George M. Ames, city engineer of Grand Rapids, Mich., reported several new features introduced into their street work, among which are brick gutters laid on graveled and on macadamized streets on foundations the same as used for the other portion of the street, with very satisfactory results. Also combination concrete curb and gutters with a band of steel ⅜ and 1¾ inch, bedded in the face of the curb at street corners, the bands anchored with countersunk bolts. He also submitted a number of specifications

for street work, among which is one for a screened gravel pavement.

In calling attention to the specifications for asphalt and brick pavements he says: "In the guarantee clause you will notice the A. S. M. I. ear marks." In these clauses is specified what shall be considered as pavement out of repair. In asphalt it is "wherever places show a disintegration of the material, or where elevations or depressions are more than three-eighths of an inch above or below the general surface of the pavement, such irregularities to be measured from a straight edge four feet long placed parallel with the curbs or from a template placed at right angles to the curbs, or, where cracks occur which show a disintegration of the material, or are more than three-eighths of an inch in width, or where the number of cracks in any fifty-foot section of the street exceeds the proportion of five feet of cracks to one lineal foot of pavement, or where the thickness of the asphalt is reduced more than that specified in the bid," while in brick pavements it is "wherever places show a disintegration of the material, or where elevations or depressions are more than half an inch above or below the general surface of the pavement." These irregularities are to be determined as in the asphalt pavements.

This subject of determining what shall be considered a pavement out of repair is a very important one, but as far as possible the requirements should be uniform throughout the country for all pavements of similarly specified construction.

Mr. A. D. Thompson reports that he placed in the guarantee clause of his contracts for asphalt pavements the specifications adopted by the American Society of Municipal Improvements at its last meeting, which defined the condition in which such pavement should be at end of the guarantee period.

Mr. H. E. Terry, city engineer of Saginaw, Mich., writes that in order to determine whether the causes of any failure of any portion of the asphalt pavements laid since 1896 are due to any reason at the plant, he employed in addition to the inspectors upon the street a chemist and two inspectors at the asphalt plant, one for the day time and the other for the night, each working twelve hours.

The inspectors were to see that the mixes were made in accordance with the specifications, to keep a record of the quantity of materials used each day, note the time they were placed in the tanks, etc. The chemist was to analyze each shipment, the results of which, with a specimen of each lot, properly labled and numbered, was filed for future reference. Careful note was also taken of the exact location of the material on the street from which each specimen was taken. This careful and systematic inspection will, if kept up, undoubtedly furnish much interesting information, besides enabling the engineer to get very closely at the actual cost of operating the plant and laying the pavement.

Annual reports show nothing new in the line of brick pavements, excepting that bricks of shale and fire-clay mixed seem to have been more generally used.

Mr. C. C. Haven, city engineer of Trenton, reports having laid brick in pavements lengthwise with the street, with the object of preventing somewhat the chipping of the edges due to the travel coming upon it. He states that fewer bricks are chipped or broken by the roller when laid in this manner,

A VIEW OF VANDEVENTER PLACE IN ST. LOUIS.

and that the joints in the center are fully as well grouted as on the sides of the street, the cement not running from the crown of the roadway to the gutter, as is the case when the transverse joints run in a continuous line across the street. His report for 1897 reveals considerable study upon the subject of brick pavements and contains much that is of interest.

In closing upon the subject of street pavements the committee stated that during the past year the white uniform for street sweepers has been generally adopted by quite a number of cities who recognize its many merits.

The reports received indicate that perhaps at no other time have there been such extensive improvements, either proposed or under process of construction, for the purifying and enlarging of the water supplies of the larger cities as at present.

New York City is at present engaged in increasing its storage capacity 32,000,000,000 gallons, by the construction of the Croton dam, requiring over 600,000 cubic yards of masonry, and also by the building of Jerome Park Reservoir, north of Harlem river, requiring over 400,000 cubic yards of rock and earth excavations, and which will have a capacity of 1,000,000,000 gallons, to be used for storage and distribution. These works will, when completed, bring the available storage capacity of the Croton water supply system to over 70,000 000,000 gallons.

The Metropolitan Water Board, which, at the beginning of this year, took possession of the waterworks of Boston and of the adjoining cities and towns, was organized late in 1895 for the purpose of providing and supplying an ample supply of pure water for the city of Boston, six other cities and adjoining towns. For this purpose it was required to construct a new storage reservoir having a capacity of 63,000,000,000 gallons, an aqueduct twelve miles in length, to finish a reservoir commenced by the city of Boston, to have a capacity of 7,500,000,000 gallons, to add pumping stations and lay great distribution mains from the reservoirs to the different cities and towns.

During the years 1896 and 1897 about nine millions of dollars have been expended in this great work. The aqueduct, the reservoir commenced by the city of Boston, the construction of a temporary dam necessary to divert the water of Nashua river into the aqueduct, have all been completed and about 57,000 tons of large water-pipes, over two-thirds of which consisted of 48-inch, have been laid. This work has been most energetically pushed during the present season.

Albany after many years of discussion and deliberation is engaged in constructing a sedimentation basin of 16,000,000 gallons capacity, of eight masonry-covered filter beds and a pure water basin of 600,000 gallons capacity. The filter beds will be of English type and have a daily capacity of 15,-000,000 gallons. The water is to be delivered into the sedimentation basin in 296 small jets, thus affording aeration.

The city of Cleveland, for the purpose of increasing and improving the quality of its water, is building a new water tunnel of nine feet internal diameter, and 26,000 feet in length. This undoubtedly will when finished be the longest submarine water supply tunnel in service. To further prevent contamination of the water supply at the new point of intake, the city is constructing an inter-

cepting sewer system which will collect all the sewage of the city and discharge the same near the bottom of the lake a long distance from shore at a point about ten miles east from the city.

The city of Chicago, aroused to the fact that the construction of the costly drainage canal will not insure its citizens a pure water supply, has commenced the construction of several systems of extensive collection and diversion sewers. These sewers are to parallel the lake shore from Evanston on the north to about Seventy-third street on the south and are to collect the sewage and storm water of all the thirty odd sewers discharging at present into the lake along the entire front of Chicago and are to divert the flow of the same from the lake front to the rivers and thence to the drainage canal. One of these main sewers will cross the north side on Lawrence avenue and discharge by pump into the north branch of the Chicago river, while another sewer, twenty feet in diameter, will cross the south side on Thirty-ninth street and discharge by pump into the end of one of the forks of the south branch, along side of the stock yards, and in this manner cause a flow in this the most stagnant slip of Chicago. Provisions will be made to pump, during dry weather, water from the lake into either of these channels. By this extensive work, in connection with the drainage canal when completed, further discharge of any sewage into the lake from within the limits of the city will be arrested and this almost constant source of pollution to some one of the many water supply tunnels be removed.

LAYING BINDER COURSE FOR ASPHALT PAVEMENT ON MACADAM IN NEW YORK.

Minneapolis has just completed its large reservoir and steel pipe lines, a full, exhaustive and interesting description of which work is given by F. W. Cappelen in his valuable report for 1897.

A number of cities along the Ohio river, which are taking their water supply from that stream, have determined to resort to sand filtration for the purpose of purifying the same. The Louisville Wa-

ter-Works Company, after an exhaustive series of experiments with a number of mechanical filters for a period exceeding a year, is constructing at present four settling basins and a clear water reservoir to be supplemented by an ample and extensive filtering plant.

The city of Cincinnati is at present engaged in the construction of a new water-works plant at a cost of about $6,500,000. The water is to be taken from the Ohio river some distance above the city, pumped to two settling reservoirs upon high grounds, having a combined capacity of about 360,000,000 gallons. After three days sedimentation, the water is to be made clear and pure by sand filtration. When completed this filter plant will be the largest in service, having a capacity of not less than 60,000,000 gallons per day.

Pittsburgh has just completed a very thorough series of experiments upon purifying its water supply by filtration, which undoubtedly will result in the erection of a suitable filter plant.

Mr. J. C. Trautwine, chief of the water bureau of Philadelphia, has just submitted a report for the filtration of all water used by the city, together with an estimate of cost covering both slow sand filtration or the use of mechanical filters, based upon a capita supply of either 100 or 300 gallons per day. He recommends the appropriation of $300,000 for the restriction of waste and the construction of a filter plant for the Roxborough district at once.

Many smaller cities throughout the country are as deeply interested in the purification of their water supplies, and quite a number have contracted for filtration plants.

In the examination of reports upon various municipal works, the committee found continuous references made to grades, which, in each instance, refer to local datum planes as a basis, which planes bear no relationship to the datum planes in any other city. The grades therefore convey no intelligent idea to the reader as to the relative elevations of these works or of the cities in which they are constructed compared with those with which he is familiar. The use of a general datum or reference plane throughout the country would at once convey a knowledge of the relative elevation of locations and works which would be interesting and valuable in many ways. Although a change of base to such general datum is perhaps impracticable at the present time, yet a determination of the relationship of the plane adopted in each city to some general base or reference plane used by the United States government at the sea coast would, if used as a reference, enable any one to obtain by comparison the relative elevations of the cities and their surroundings. "Mean tide at New York City," Mr. Benzenberg says, "might perhaps be adopted for such general use, as I believe it has been used by the general government and transmitted or carried in its surveys to many cities in the interior, and therefore, with a little special effort, its relationship to the local datum can be established and published in the annual reports."

EUCLID AVENUE, ST. LOUIS, PAVED WITH BRICK.

THE SEWERAGE OF BALTIMORE.*

By Kenneth Allen, C. E.

Strictly speaking, Baltimore has no sewerage system, although the city has spent in the past over $4,000,000 in the construction of storm-water drains, and there are many private sewers.

The city has suffered in consequence of the lack of proper sewerage for many years. I do not mean by this that the death-rate is excessive—it is in the neighborhood of 19 per 1,000. But the use of cess-pools is a detriment to property, the want of sub-drainage in the business districts retards improvements, the use of the gutters for waste water is offensive to those unaccustomed to it as well as a nuisance to all when obstructed by ice in the winter, and then there is no question but that the introduction of a proper system of sewerage would so improve the general sanitary condition of the town as to lower the death-rate by at least 1 or 2 points. Dr. John S. Fulton, secretary of the Maryland State Board of Health, estimated that with a population of one million, 373 lives would be saved annually by the consequent reduction in typhoid mortality alone.

When it is realized that such conditions exist to-day in a city of over a half million inhabitants, that of all our large cities, New Orleans is the only other one remaining without sewerage facilities, while a beginning has already been made there in that direction; and when we remember that for the past forty years the city of Baltimore has had the matter under discussion, we must admit that the time is ripe for a change. It is believed that the citizens realize this fact and will before long take active measures to prosecute the work.

Before speaking of the proposed system, as outlined by the sewerage commission, I wish to state briefly the situation to-day.

In the first place, cesspools are almost universally used by both rich and poor, great reliance being placed upon seepage into the soil to carry off the liquids. Of the remainder, some 50,000 gallons are removed daily by odorless excavation, at a price of $2.50 per load of 200 gallons, and are taken to one of two wharves designated for the purpose. Here they are delivered to a contractor, for 25 cents a load, and dumped into a barge holding, generally, 450 loads, or nearly 100,000 gallons. It is then conveyed in the barge by a tug to farming lands situated some eight or ten miles below the city, where it is sold to farmers or utilized on farm lands owned by the contractor.

It is pumped from the barge by powerful steam pumps, carried on a special pump-barge, into large pits dug by the farmers. These vary in size, but average perhaps 30 feet x 100 feet depth, and hold about a barge-load each. The farmer pays for this $1.67 per 1,000 gallons, or something over $100 a load, and there is no trouble in disposing of something over twelve million gallons a year at this price. The sludge left in the scow is shoveled into carts and taken by the farmer.

The liquid portion, or "soup," is bailed from the pit into tank-carts, when wanted by the farmer, and sprinkled by him on the land.

* Read before American Society Municipal Improvements, Washington, D. C., Oct., 1898.

There is very little smell from either the pit or the farm lands, though garbage, disposed of on lands in the same neighborhood, is very offensive.

The liquid is said to be more effective as a fertilizer than the sludge but more transient in effect. The soil is heavy, containing much clay, and the crops raised are principally cabbage, kale, tomatoes, potatoes and spinach. The night-soil, it should be noted, is said to be applied to the crops some weeks before gathering.

I have described this system of night-soil disposal somewhat fully as it is carried on by a system and on a scale which are unique in this country.

In topography the city is hills, the northwest corner rising to 460 feet above tide. The area is about 32 square miles, comprising

8	sq. mi.	of clearly built-up territory.
5	"	partially " "
16½	"	rural area and parks.
2½	"	water surface.

Its surface has a decided slope towards the Patapsco river on the south, toward Jones' Falls, a stream which flows in a southerly direction through the heart of the city, and to several other streams of more or less magnitude, insuring a speedy and complete removal of sewage to the outfall.

For 1893 a commission was appointed by the mayor to "examine into the necessity for a more perfect system of sewerage for the city of Baltimore * * * together with recommendations as to the system to be adopted, and the mode of carrying the same into effect."

This commission, which now consists of Messrs. Mender Cohen, F. H. Hambleton and E. G. Bartlett, presented its report last winter after a thorough investigation of the problems involved, in which they were aided by the services of Consulting Engineers Rudolph Hering, Samuel M. Gray and Gen. Wm. P. Craighill.

The entire design was seen to depend, first, on whether the combined or separate system should be adopted, and, second, on the method of disposal. Both of these decisions were controlled by the following considerations:

In the first place, the flow in the Patapsco, which can only result from the combined discharge of its small tributaries, is insignificant, and entirely inadequate to effectually dispose of the sewage from a large city. Our consulting engineer estimated that it could be relied upon to dispose of the sewage from but 37,000 persons without danger of offense. Again, the tides, which may be availed of during the ebb to carry down stream sewage retained in reservoirs during the flood, are also quite inadequate for the purpose, rising and falling on an average but 16 inches. And, finally, aside from any possible danger to riparian interests from fouling the shores, there were the oysters of the bay to protect —a very important source of revenue to the state, and one giving rise to an industry employing a great many men. Therefore, the sewage, if discharged into the harbor, would have to be tested at an expense bearing some relation to its volume, or, if carried by an outfall sewer to the bay, the great distance would preclude the conveyance of storm-water as well, without prohibitory expense. For these, and other reasons, together with the fact that storm-water is already partially provided for by a number of large and costly drains, it was at once decided that the separate system was the only one to be considered, and that the problem

before the commission was virtually boiled down to that of disposal.

It was found that either of three plans was available, *dilution* in Chesapeake Bay, *chemical precipitation*, or *agricultural filtration* on the sandy soil of Anne Arundel county, some eight or ten miles south of the city.

Of these, the latter was agreed upon as the most perfect, because it would deliver, under proper superintendence, an effluent biologically and chemically pure, but unfortunately the cost of delivery by steel pipes under the Patapsco in a siphon a mile long, and through a tunnel 8,000 feet in length, in addition to a greatly increased annual charge for pumpage, resulted in an estimated cost for construction of $17,451,803, as against $10,409,167 in the case of dilution, and for a maintenance of $966,843, as against $355,191. This difference of over $7,000,000 for construction and $600,000 for maintenance made it incumbent on the commission to investigate the objections to dilution in Chesapeake Bay.

A party was made up and stationed on a schooner on the bay where current observations were made from a steam launch, and sometimes from a tug also, by means of sextant observations on known points from the position occupied by floats. The latter were yellow pine rods, 2 inches square and from 6 to 8½ feet in length, carrying a flag with a number for identification at one end and a weight consisting of iron washers strung on a wire at the other. They were set out from known positions from 1 to 3½ miles east of what is known as the Rear Range Light of the Craighill channel at all stages of the tide, and observations were carried on for a full month. The platted courses of these floats served to indicate the possible dispersion and drift of the sewage if discharged at the several points and the conclusions reached were that, with the almost unlimited dilution from the watershed of the Susquehanna, exceeding in area that of any other river between the St. Lawrence and the Mississippi, there would be no question as to freedom from offense from the discharge of the sewage at a suitable point. Such a point was first fixed at 2½ miles east of the said light-house and some 2 miles from the nearest shore, the tendency of the currents being to carry any sewage discharged there down the channel in the center of the bay, as well as to insure a rapid dispersion or mixing. Also, from the fact that the nearest marketable oysters lie in beds or in "lumps" in comparatively shallow water some six or seven miles away from the prepared point of outfall, the danger of infection was believed to be so very remote as to be insignificant.

It was suggested that a discharge of sewage into the bay would be detrimental to fish life, to the crabs, which form a staple food product of the state, as well as to oysters and other mollusks. In this connection the following statement of Mr. Wm. M. Brown, Jr., Chief Engineer of the Metropolitan Sewerage Commission of Boston, regarding the discharge of 40 million gallons of sewage daily into the bay, are of interest. He says: "Deer Island Bar, at the outer end of which our metropolitan sewer outfall is located, is visited by crabs and great quantities of starfish and minute mollusks and snails. Entire sections of this bar near the outfall are covered by these minute bivalves as with a carpet. They are not edible. The

only edible fish product within the range of our outfall known to me are the well-known varieties of cod and perch, which are found in abundance within 500 feet of the outfall, and used by our employes and others. Great quantities of lobsters are also obtained nearby. Our employes for three years have maintained lobster traps within 500 feet of the outfall, and within range of half a mile it is estimated that there are two hundred others, the product of which is sold in the Boston market. Marston & Co., * * the most extensive dealers in lobsters in this market, estimate that in Boston harbor, within a range of one mile from our outfall and that of the Boston Main Drainage Works, at Moon Island, seventy-five tons of lobsters are gathered annually for the Boston market." All such assimilate sewage if fresh, and convert it into perfectly good wholesome food. The reason why a densely-polluted water, such as is found in Baltimore harbor, will destroy fish life, is not that the sewage is harmful in itself, but that the bacteria developed therein deprive the water of its oxygen, upon which fish depend.

From all the evidence collected, and a study of the subject from a biological point of view as well, the commission felt justified in recommending this less costly scheme, and so reported. The report, however, raised a strong opposition from those interested in the oyster trade, fearing an injury to their business, if not to the oyster itself. So strong was the feeling, that the commission was requested to continue its investigation and recommend some system which would provide for a purification of the effluent. It was naturally assumed that agricultural filtration would be the alternative selected, but, as is well known, the past year has been remarkable for the development of several processes of bacterial purification of sewage, including rapid filtration through specially prepared media, which the commission has thought advisable to look into before arriving at definite conclusions. Among those of particular prominence just now are the septic tank treatment as in use at Exeter and Yeovil, England, and at Armagh, Ireland, and the Moncrieff process, just installed at Caterham, England—both of which depend upon the action of anærobic bacteria, coke filtration, as employed by Dibdin, at Sutton, England, and forced aeration, as introduced by Waring, at Willow Grove Park, Pa., Homewood and Tuxedo Park, N. Y. The "International," or ferozone-polarite process, too, is highly endorsed as a method of chemical precipitation, and a plant is just being installed for the city of Madison, Wis.

It remains to be seen whether one or more of these or other methods of purification may be availed of by Baltimore to advantage.

The problem of financing a piece of work such as this for Baltimore is of the utmost importance. The taxable basis of the city this year is but $367,042,811 and most of this is assured at a rate of $2.25 on the hundred. This, with the necessary expenses for public improvements, is already a burden to many, and the commission has therefore given considerable thought to the solution of the problem.

The reported estimates for the filtration scheme were as follows:

	For 330,000 population. Construction, Maintenance, Interest and Renewals.		For 1,000,000 population. Construction, Maintenance, Interest and Renewals.	
Interceptors, Pumping Stations and Disposal District and Lateral Sewers	$5,840,207 2,032,500		$12,196,803 5,280,000	
Total	$7,872,707	$423,277	$17,476,803	$966,844

In general, the plan recommended contemplates an issue of long-term bonds to provide for the construction of the interceptors, pumping plant and disposal work, while the network of laterals would be paid for by a direct assessment against abutting property. The annual charges, consisting of interest, sinking fund, maintenance and renewals, would be met by a system of rentals similar to that in use by the water department. Such a plan has just been adopted by the city of Boston for its sewerage work.

Based upon the estimates given in the report for the most costly project—that of agricultural filtration—the annual rental per house would possibly average at first somewhere between $5 and $10, and this would diminish as time went on until after the liquidation of the bonded debt and deducting the actual present cost of cleaning cess-pools, the extra expense due to the installation and operation of the proposed works would practically disappear.

FLUSHING DEVICES FOR SMALL SEWERS.*

By Asa E. Phillips, Assistant Engineer, Sewer Dept., Washington, D. C.

The general principle of the flushing device is to suddenly discharge into the sewer a considerable volume of water for the purpose of cleansing the pipe of stranded solids. As a rule the siphon is six or eight inches in diameter, and is usually somewhat smaller than the sewer to which it is connected. The quantity of water is measured by the horizontal section of the tank, since the depth of discharge is ordinarily constant for one size of siphon. The amount of discharge per second varies somewhat for the different varieties of the device and different local conditions, but is roughly stated as one cubic foot per second for the six-inch siphon and two cubic feet per second for the eight-inch. No formula has been proposed for the volume of water required for different grades and sizes, and the only rule known to have been used appears to be of little value. This important detail is determined by individual judgment, generally unsupported by investigation or experiment, so that the common practice has varied within a large range of values, while tanks of uniform size have been usually constructed, regardless of differences in the size or gradient of the sewers to be flushed. The uncertainty as to the precise effect of the flush, and the complex conditions as to contributing popu-

* Read before American Society Municipal Improvements, Washington, D. C., Oct., 1898.

lation, rate of water consumption, etc., have been justly considered a bar to any precision in this regard. Recent discussion of the subject, however, has tended to establish certain limitations in the use of flushing devices which should lead to improvement in the general practice.

The work to be accomplished by the flush is the removal at regular and frequent intervals of solid matter flushed into the sewer from house laterals, and there stranded because of the shallow depth of flow and sluggish current, and its carriage down the line to the point where the depth and velocity are sufficient to insure removal to the ultimate point of discharge. The efficiency of the flushing device in performing this work is not well understood. But little is known of the effect under the varying conditions encountered, especially for widely different grades, and at considerable distance from the dead end. It is generally considered, however, that the effect diminishes very rapidly as the distance increases, becoming almost imperceptible 600 or 700 feet from the tank, but so far as can be ascertained, this has been observed only in cases of flush of small volume on flat grades, or where the depth of ordinary flow was considerable. Of the effect of discharge of 600 gallons or more, such as were used in the cases to follow, there appears to be no recorded observations, so that no comparison with those already published can be made. Several grade conditions have been selected, for the purpose of illustrating the effect of the flush under such circumstances, and an attempt made to indicate by means of diagrams the different results obtained. For these no special accuracy is claimed, but in the few cases given, the differences are sufficiently marked to suggest certain conclusions therefrom.

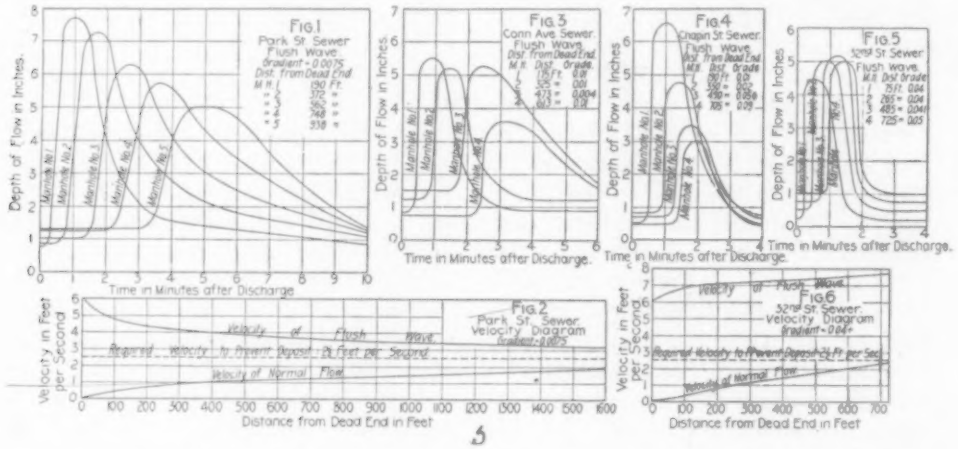
The Park-street line is the first of these. This sewer is twelve inches in diameter, about 1,870 feet in length, and has a uniform grade throughout of nine inches per 100 feet. Preliminary examination discovered slightly unfavorable conditions for experimental work, such as an uneven grade, rough joints and poor alignment in places, all of which affected the observations and results to some extent. It may now be stated that with the exception of the Chapin street line, these sewers cited are old and generally possess these irregularities, but excepting slight silt accumulation at points distant from the basin, they were found to be very clean. The presence of even a small amount of silt in the invert, particularly at manholes, undoubtedly affected the flow and was the chief source of error in the observations.

The tank on Park street was found to have an effective capacity of eighty-four cubic feet or about 630 gallons, and discharged through an eight-inch siphon in the meantime of forty-two seconds. No attempt was made to determine the velocity at the point of discharge, but this date would indicate an approximate mean velocity of six feet per second. Observations of the flush were simultaneously taken at all of the manholes, and the depths of flow were recorded at intervals of fifteen seconds or less. These depths were referred to the time of siphon discharge and the diagrams of the flush waves have been constructed from this datum.

The first diagram (figure 1) shows the form of the flush wave as taken at five consecutive manholes, within 1,000 feet of the tank. The lower four manholes were not plotted be-

cause of the confusion of lines that would result, but the data are given in table 1. This diagram and tabulation show how well the depth of flow is maintained for very long distances. One thousand feet from the dead end the flush is very efficient, and at a distance of nearly two thousand feet appears to be quite effective. This large radius of effect doubtless is the result of the volume of water used, as published diagrams for smaller discharges indicate that a tank of half this capacity would have a greatly diminished influence.

The second diagram for this line (figure 2) shows the computed velocity curve for the ordinary flow, the assumed velocity to prevent sedimentation and the accelerated velocity due to the flush. These curves are not supposed to be precise, but they illustrate the purpose of the flushing device, and to some extent the degrees of effectiveness required. The curve of normal flow shows the very low velocity along the upper portion of the line, and its gradual increase approaching the required velocity at the lower end, while the flush curve shows a corresponding high velocity at the upper end and its rate of fall toward the two and one-half feet per second velocity, where in theory at least it would seem that the two curves meet at a common tangent point. In this sewer it may be noted the normal flow does not attain a rate of two and one-half feet per second, and probably would not for a distance of 2,000 feet. It is also to be observed, however, that the flush would seem to maintain this velocity for a distance probably as great. So that, so far as these observations go, they indicate that



5

TABLE 1—PARK STREET SEWER.

Capacity of Tank=84 cu. ft.=630 gallons. Time of Discharge=42 Seconds.

Reach.	Size.	Grade per cent.	Distance from dead end—ft.	Depth of Flow. Normal Inches.	Depth of Flow. Flush Inches.	Duration of Greatest effect. Min.	Duration of Greatest effect. Sec.
Tank to M. H. No. 1	12 in. d.	¾	200.	0.75	7.75	1	00
" " 2	" "	"	382.	0.87	7.25	1	15
" " 3	" "	"	672	1.00	6.25	1	45
" " 4	" "	"	738	1.25	6.75	2	00
" " 5	" "	"	948	1.25	6.00	2	15
" " 6	" "	"	1182	1.37	4.50	2	50
" " 7	" "	"	1332	1.50	4.00	3	00
" " 8	" "	"	1486	1.75	3.50	3	45
" " 9	" "	"	1688	1.75	3.25	3	45
" " 10	" "	"	1869				

for this very long line and flat grade, the flush tank is efficient and of the proper size.

The second series, taken on one of the Connecticut avenue sewers, is chiefly interesting as showing the effect produced on a varying and decreasing gradient.

TABLE II—CONNECTICUT AVENUE SEWER.

Capacity of Tank=82 cubic feet=615 gallons. Time of discharge=45 secs.

Reach.	Size.	Grade—per cent.	Dist. from dead end—feet.	Depth of Flow.		Duration of greatest effect.
				Normal Inches.	Flush Inches.	Min. Sec.
Tank to M. H. No. 1	12 in. d	1	175	0.87	5.50	1 15
" " " 2	" "	1	325	1.25	5.25	1 30
" " " 3	" "	0.4	478	1.50	6.25	3 00
" " " 4	" "	1	613	1.00	3.50	3 00

The diagram (figure 3) illustrates the diminished velocity and enlarged area of section of the flush wave as recorded at manhole 3, showing the marked effect of the reduced rate of grade in the portion of the sewer immediately above. Unfortunately, this could not be further observed, owing to a change in gradient from this point. It probably indicates, however, that for a line of varying slope the minimum should be considered in fixing the capacity of the tank.

The third series was taken on the Chapin-street sewer, which has the reversed conditions of a varying but rapidly increasing gradient. The observed effect of the flush is very clearly shown by the diagram. (figure 4.) The rapid run-off and greatly reduced area of section toward the lower end of the sewer, indicate the very high velocity which such steep slopes must produce. In this case the minimum grade being one per cent. and that for a length of but 190 feet, a flush tank of considerably less capacity would probably be sufficiently effective; if indeed for such grade conditions automatic flushing is at all necessary.

TABLE III—CHAPIN STREET SEWER.

Capacity of Tank=88 cu. ft.=720 gallons. Time of discharge=48 seconds.

Reach.	Size.	Grade—per cent.	Distance from dead end—feet.	Depth of Flow.		Duration of greatest effect.
				Normal Inches.	Flush Inches.	Min. Sec.
Tank to M. H. No. 1	12 in. d.	1	190	0.50	6.50	1 00
" " " 2	" "	2	350	0.75	4.75	1 00
" " " 3	" "	5.6	490	0.75	3.50	1 00
" " " 4	" "	9	705	0.50	3.00	1 00

The fourth series, taken on one of the Thirty-second street sewers, shows the observed effects on a nearly uniform steep grade. The first diagram (figure 5) for this line shows the form of the flush was as observed at each manhole. The quick run-off and nearly uniform area of section maintained, indicate the piston-like effect of the discharge. In fact, the flow was so rapid and so quickly past as to render the taking of the observations rather difficult, and their relative accuracy to some degree uncertain. The curves here and there seem to suggest such unavoidable irregularities, but the general effect is very

clearly shown. The second diagram (figure 6) indicates the approximate velocity attained by the flush

TABLE IV—THIRTY-SECOND STREET SEWER.

Capacity of Tank—84 cu. ft.=630 gallons. Time of discharge=45 seconds.

Reach.	Size.	Grade—per cent.	Dist. from dead end—feet.	Depth of Flow. Normal—inches.	Depth of Flow. Flush—inches.	Duration of greatest effect.
						Min. Sec.
Tank to M. H. No. 1	12 in. d.	4	75	0.12	4.50	1 00
" " 2	" "	4	205	0.25	5.00	1 00
" " 3	" "	4.1	485	0.75	5.12	1 00
" " 4	" "	5	725	1.00	5.00	1 00

in connection with the assumed 2½ feet per second constant, as well as the estimated velocity of the ordinary flow. This shows in another form the marked effect of the discharge on a steep slope, and also how quickly on such grades the normal flow attains sufficient velocity to prevent deposit. From a study of these diagrams we may conclude that the flush increases rapidly in effectiveness as the rate of grade increases, having a remarkable scouring power on grades of four per cent. or more. But at the same time the necessity for automatic flushing decreases correspondingly, there being apparently little need for the device on slopes approaching four per cent.

As has been stated, no formula has yet been proposed for the quantity of water required to flush for the several conditions as to size, gradient, etc. In a general way it has been said that "long lines on flat grades require greater capacity of tanks than steep slopes or short lines;" but no attempt to formulate these factors for discussion has been made. Aside from the cost of construction and maintenance, economy in the use of water would give to the subject some importance, for one 400-gallon tank requires for a thirty-six hour discharge no less than 100,000 gallons per annum. However, the uncertain and variable conditions controlling the amount of ordinary flow, etc., would make such a formula of little practical usefulness, it would seem of some value in considering the factors in the problem which are comparatively well understood, at least so as to show to some degree the limitations governing the use of this device for the conditions which are easily determined. Briefly, the object of the flush is to secure a periodic velocity of more than two and one-half feet per second in the upper portion of the sewer and to maintain the same to a point where the ordinary flow attains this rate. Disregarding the amount of normal flow, it is evident that the quantity of water to satisfy this condition is a function of the diameter of the sewer and of its gradient. From general consideration of the well-known formula for velocity

$$V = C\sqrt{RS}$$

remembering that for circular conduits the hydraulic radius is a direct function of the semi-diameter, we may consider (1) the quantity, Q varies directly as the square root of the radius and inversely as the square root of the slope; and, to complete the statement of controlling conditions, (2) that it varies directly as the length of sewer from the dead end to the point where the normal flow becomes sufficient to

maintain a velocity of two and one-half feet per second. Under these assumed conditions, designating this distance by L, in linear feet, letting C represent the necessary modifying co-efficient, Q the quantity in cubic feet and R the radius of the sewer in feet, the formula would take the shape

$$Q=\frac{L\sqrt{R}}{C\sqrt{S}}$$

Solving this equation for the data given on the Park street line, we obtain a rough approximation for C of 190.

Let us now consider the factors which establish the value of L. If we let A represent the area of cross-section of normal flow for any given gradient required to produce the velocity of 2½ feet per second, and let D equal the increment in discharge for each linear foot of sewer in cubic feet per second, then

$$L=\frac{2-\frac{1}{2}A}{D}$$

In which A is definitely determined by an application of Kutter's formula. The quantity D is evidently a function of the number of persons, or premises tributary to the sewer and of their per diem water consumption. But these are variable quantities, rarely the same for two sewers. A uniform contributing population of 30 persons per 100 feet of sewer, with a daily flow per capita of 100 gallons, ¾ assumed to run off in 6 hours, would give a value for D of 0.00015 cubic feet per second (table 5), gives the value of A for different grades and the corresponding depth of flow in inches.

This table indicates the very small flow on the larger grades necessary to maintain a self-cleansing velocity, and the relation between the ordinary discharge and the rate of grade within the limits given.

Table 6 gives the various quantities of water obtained by the formula for the foregoing grades and sizes under the conditions which have been stated, allowing an increased rate on long lines and a diminishing rate of flow on short lines, from the average value of 0.00015 cubic feet per second :

TABLE V.

Grade.	Areas of section for 2½ feet per second velocity. Square Feet.				Depths of flow for 2½ feet per second velocity. Inches.			
	6 in. d.	8 in. d.	10 in. d.	12 in. d.	6 in. d.	8 in. d.	10 in. d.	12 in. d.
⅛	.....	.2295	.2265	.2370	.....	5.0	4.8	4.1
¼	.1850	.1306	.1876	.1500	3.9	3.2	3.0	2.9
½	.0967	.1017	.1080	.1150	2.9	2.7	2.5	2.4
1	.0431	.0600	.0550	.0600	1.7	1.6	1.6	1.5
2	.0310	.0355	.0376	.0412	1.3	1.3	1.2	1.2
3	.0229	.0252	.0284	.0311	1.0	1.0	1.0	1.0
4	.0178	.0212	.0248	.0275	0.9	0.9	0.9	0.9
5								

TABLE VI.

Volume of Water Required to Flush.

Grade Per Cent.	12 in. d.	10 in. d.	8 in. d.
	Cubic feet.		
⅛	100	90	80
¼	80	65	55
½	70	55	45
1	35	30	20
2	25	20	15
3	20	15	10
4	15	10	8
5			

These results indicate that a very considerable modification of the volume of water should be allowed for lines of different gradient, and that the required volume diminishes very rapidly with an increase

of grade; also that it is affected to a smaller extent by the size of the sewer; that for all sizes no flush tanks are probably required on slopes exceeding 2 per cent., and it may be inferred in such cases also that flushing at less frequent intervals is needed than the 24 to 48 hour discharge.

The rule previously alluded to is given by the manager of a flush-tank company and is as follows: "The capacity of the tank should be equal to that of one-half the length of sewer in which the grade produces a rise equal to the diameter of the pipe." For the purpose of comparison with the formula already given, we may readily reduce this statement to the form

$$Q=\frac{3.14R^3}{8}$$

in which Q=quantity of water in cubic feet; R=radius of the pipe in feet; S=grade, and in this formula it appears Q varies as the third power of the radius. That this does not seem to satisfy the hydraulic conditions imposed may be readily seen, for example in the case of a 10-in. d. and a 12-in. d. pipe, the quantities for which should not greatly differ. Only about one-half the volume is given for one as for the other. Also Q varies directly as the slope, giving about one-half the quantity for an 0.8 per cent. as for a 0.4 per cent. grade. The effect of changes in size and grade are thus considerably exaggerated as inspection of the formula at once indicates.

To a smaller degree the proper proportioning of the flush-tank would seem of the same importance as that of the sewer itself. But in communities having a limited supply of water the question becomes more serious, and in one case,* at least, has seemed to justify abandoning the use of automatic flushing altogether. And yet this single experiment, however successful, can hardly warrant the general adoption of the method here used. Although hand-flushing is reported to have kept this system in working order, the actual condition of the sewers would have to be more carefully studied before concluding the method an unqualified success. In any case the flush-tank is an excellent device, and under the best conditions performs its work admirably. It is true its automatic action is considered by many to be very unreliable; but this is largely due to a lack of understanding of the simple physical laws governing its operation, as well as to a deep-rooted impression that it is a sort of perpetual motion machine—once started to run forever. With reasonable care in construction, supplemented with intelligent and methodic inspection, the siphon will give a service of almost absolute regularity, and without wasteful use of water.

The employment of an insufficient volume of water to effectively flush is an error of no less consequence, and probably has brought the flush-tank into some disfavor, for a small discharge has been found to exhaust its effect within a short distance of the dead end without accomplishing the work intended, while at the same time the annual expenditure of water has been large, and more than sufficient for a thorough if less frequent flushing by other means. No arbitrary minimum for the capacity of the basin can be stated, but it seems probable that for lines requiring less than a 300-hundred gallons automatic flushing had best be omitted. And finally it would appear that the flushing device can hardly be expected to impart a

*Mount Vernon N. Y., semi-annual flushing. Water mains connected direct with sewers at dead-end. See Transactions Am. Soc. C. E. Vol. XXXIV, No. 3.

cleansing velocity on grades too small to maintain the same.

As has been seen, no attempt is here made to indicate the results with a variable volume of discharge, for the purpose of determining the comparative radius of effect under such circumstances. This and other interesting details are necessarily omitted; an effort having been made only to show the general influence of the slope on the flush, and in a limited way, the range of effect.

In conclusion, it may be said that the formula suggested is not expected to satisfy exactly all of the fixed hydraulic conditions of the problem. That it approaches the form which such an equation should have and indicates the limits governing the use of flushing devices is all that can be said.

GARBAGE DISPOSAL.*

By Arthur R. Reynolds, M. D., Commissioner of Health, City of Chicago.

During the year I have had occasion to give some additional study to the question of the collection and disposal of Chicago's wastes, including ashes and garbage.

This study was directed chiefly to the local situation; but the conclusions arrived at have a general applicability. The points dealt with are:

First. The desirability of making separate contracts for the collection and disposal of garbage and for the collection and disposal of ashes and other wastes.

Second. The imperfect state of all methods of garbage disposal so far as examined.

Third. The disparity in the values of the utilizable products of reduction processes.

Fourth. The feasibility of simplifying the collection and disposal of certain wastes by a proper control of the junk trade.

1. The desirability of separating the contracts is suggested by the fact that the bidders are generally men skilled in the handling of garbage only, and not familiar with the conditions which obtain with regard to ashes and other wastes.

Any estimate based on the cost of the collection and disposal of ashes in most cities of the country would be too high for Chicago, because of the ready means of disposal with short hauls which this city affords, where clean ashes are in demand and have value for filling purposes. It is probable that most bids are higher than they would be if this fact were fully appreciated and if the value of the waste paper, rags, metal and other junk collected with ashes were taken into account.

Among other reasons for dividing the contracts may be mentioned the fact that the contractor for the removal of ashes needs no skilled knowledge of garbage collection and disposal. Ashes do not decompose and become a menace to health, as does garbage if not promptly and properly disposed of.

The penalty for failure in the ashes-removal contract need not, therefore, be so high; and, if divided, either the ashes contractor or the garbage contractor might fail without the one affecting the other. As a matter of fact, the garbage-disposal people do not

* Read before American Society Municipal Improvements, Washington, D. C., Oct., 1898.

want anything to do with ashes or other wastes.

Such a division of the work would lessen the labor of the city in enforcing the separation of garbage from ashes by the householder, which separation is a prime condition of economical garbage disposal. And it would, moreover, pave the way for the ultimate assumption of the entire work by the city and the abolition of the contract system, which seems to me desirable.

2. Much progress in the various reduction processes has been made during the last few years, but it may be said that garbage disposal is to some extent still in the experimental stage. Within the next few years it is possible, though not very probable, that Lord Kelvin's process for the "extraction of heat and light from garbage" may be available in this country, as it is asserted it already is in Shoreditch, Eng.; or that a still more recent invention may be offered to us, whereby it is claimed that 14,000 feet of illuminating gas are to be obtained from every ton of garbage at a merely nominal cost.

Aside from these possibilities, it is a fact that inventive talent and large sums of money are being directed to the solution of the garbage-disposal problem, and that the imperfections which were found in every plant examined bid fair to be remedied in the near future. Even in the most successful plants the operators admitted that improvements and alterations were necessary, and claimed that these were already planned and would soon be made.

Whatever process is adopted, however, whether incineration, reduction or conversion into fuel or illuminating gas, it still remains that the handling of garbage in large quantities is attended by certain objectionable features, chiefly the production of offensive and unsanitary odors. This precludes the concentration of any considerable amount of garbage, either for shipment or for treatment, in the vicinity of human habitations.

3. The wide disparity in the quantities and in the commercial values of the utilizable products of the various reduction processes in different localities would seem to be an important element in determining bids. These products are chiefly grease and tankage or fertilizer base.

Ordinary city garbage yields from 2.4 to 3.9 per cent., or an average of about 3 per cent. of grease, worth at the present market price 2⅛ cents per pound.

The amount of fertilizer base yielded by the different reduction processes varies from 14 or 15 per cent. to about 30 per cent.—average 22.5 per cent. I have not been able to learn definitely the value of this product, but Mr. MacDonough Craven, one of the New York experts, fixes, as the result of treatment by different methods of 3,000 tons of summer garbage from different cities, its average value at $1.27 per ton of garbage. This is probably a minimum figure; it is certainly much lower than anything I heard mentioned in the different cities visited. For the present purpose, however, it may be accepted in order to illustrate the disparity in the value of utilizable products from garbage reduction.

The average daily output of garbage in eight cities where the garbage collected was carefully weighed for several successive months in 1895 was .57 of a pound per capita, or 208 pounds per year of 365 days. I was able to get accurate figures of the quantity of garbage produced

in only three of the cities visited for the purposes of this investigation—namely, Buffalo, Detroit and Bridgeport. In these cities practically all of the garbage output is collected and accurately weighed. They have an aggregate population of 600,000, and their aggregate garbage collection for the previous twelve months averaged 144 tons per day—equivalent to a little less than half a pound (.48) per day per capita of population.

It will probably be safe to assume half a pound per day for Chicago, and, upon the basis of 1,650,000 population, or 30,000 more than the department computes the death rate upon, this would give a daily garbage output for Chicago of 412.5 tons per day, or 150,562.5 tons per annum. This would yield the following quantities and values of grease and tankage, according to the processes employed:

Grease.

At a minimum yield, 2.4 per cent., 36,135 tons, at $42.50 per ton	$153,573 75
At maximum yield, 3.9 per cent., 58,719.4 tons, at $42 50 per ton	249,557 45
At average yield, 3.15 per cent., 47,427 2 tons, at $42.50 per ton	201,565 60

Tankage.

At maximum yield of $1.693 per ton of garbage	$255,152 87
At minimum yield of $0.847 per ton of garbage	127,526 43
At average yield of $1.27 per ton of garbage	191,839 55

These figures show values of utilizable products from Chicago garbage as follows:

By the least productive process	$281,100 18
By the most productive process	504,710 32
By the average of all processes	392,905 25

with a difference of $223,610.14 between the different processes operated in various localities.

These estimates are based on the lowest prices for the products; grease is probably worth a third more and tankage three times as much as the prices above given.

I was unable to obtain any authentic data of the relative cost of operating the various plants in the cities visited; but it does not seem probable that there can be any such disparity in the cost of operating as there is between the values of the products; and it must be obvious that, all things considered, the method or system which—with due regard to sanitary conditions and inoffensiveness of operation—gets the most out of the garbage must be the best and most economical.

4. The better regulation of the junk trade which deals with rags, bottles, waste paper, old rubbish, metals, etc., has also a bearing on garbage disposal, inasmuch as these articles frequently find their way into garbage boxes and so add to the labor, which increases the cost of handling.

The trade is quite profitable and I have reason to believe that if it were properly systematized, its regulation and supervision might be made to yield the city a revenue. Such regulation is demanded also as a sanitary measure as well as for police purposes. Infected rags, bedding, etc., are frequently stored in junk-shops without proper treatment, while these places are not infrequently used as "fences" for the disposal of stolen property.

The division of the city into junk districts, the letting of the privilege in each to the highest bidder, the location of the shops where they will be least objectionable, are some of the features of this better regulation which have occurred to me. Many minor nuisances might thus be abated and our streets and vacant lots be kept cleaner and more tidy in appearance.

MUNICIPAL DATA.

Following is the proposed form for sewer reports, prepared by Captain Lansing H. Beach, for the report of the committee on municipal data of the American Society of Municipal Improvements. It should be considered in connection with the forms for water and street reports presented with the committee's report in the November number of MUNICIPAL ENGINEERING. The committee has been reappointed by President N. P. Lewis, and is very desirous of receiving criticisms of the forms of report in detail and suggestions for additions, omissions or modifications. The committee is composed of Charles Carroll Brown, chairman, Bloomington, Ill.; Captain Lansing H. Beach, Washington, D. C., and A. D. Thompson, city engineer, Peoria, Ill.

PROPOSED FORM FOR SEWER REPORTS.

General Statistics.

Systems in use: Separate or combined: Method of disposal of sewage.
Interceptors?
Sewage allowance per capita.
Storm water formula or rule, with reasons for any modifications.
Discharge formula?
Special local features affecting system.
Guarantee period under contract.
Location of sewer in street; center; sidewalks; single or double line for street, etc.
Rule for depth.
"Y" or Tee branches used or not; if so, on what sewers; if not, manner of making house connections.
Difficulties of maintenance encountered.
Flushing methods.
Have sewers ever been overtaxed? If so, particulars.
Is sewage pumped? If so, by centrifugal or plunger pumps.

Construction Data.

Amount of pipe sewers in use at beginning of year.
Amount of other sewers in use at beginning of year.
Amount of each laid during the year.
Amount of each at end of year.
Sizes and forms used, circular, egg-shaped, pipe, etc.
Lining material.
Average amount of each size built per day.
Character of excavation: average and extremes.
Foundations used, if any.
Special constructions.
Concrete, methods of mixing and placing.
Method of consolidating trench back filling.

Labor and Materials.

Cost of materials, cement, sand, brick, gravel, broken stone, pipe, each size, etc.
Cost of labor per hour, different classes.
Cost of wagons and carts per hour.
Cost of foremen.
Cost of superintendence.
Cost of excavation, per cubic yard.
Cost of sewer pipe.

Financial Data.

Total amount expended during year for sewers.
Total amount expended to date for sewers.
Manner of raising money expended.
Total amount of outstanding indebtedness, city's portion, property owner's portion.
Proportion of cost paid by city and property-owners.
Method of assessment, by frontage or area of contiguous property.
If non-contiguous property pays any portion of cost, manner and amount.
Methods of paying assessments.
Bond issue, if any, period, amounts, interest, redeemable; whether general city charge or lien on property assessed.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

MEASURES FOR THE PROTECTION OF GAS CONSUMERS.

I desire to get some information on the subject of measures adopted in American cities for the protection of the consumer against irregularities in the measurement and quality of gas.

John H. Watkins, City Attorney,
Memphis, Tenn.

Many cities have provisions for testing candle power of gas and some for payment of city lighting bills on the basis of the candle power. A few have meter-testing departments where consumers may have their meters tested, the payment for the service in some cases being made by company or consu-

mer according to whether the meter is wrong or right. Boston, Providence, Washington, Chicago, and possibly St. Louis are suggested as having some of these provisions. There are many others.

COST OF A LIGHT SUSPENSION BRIDGE.

We are contemplating building a foot bridge across the river here, which is 175 to 200 feet from bank to bank and it must be cheap and durable, rather than beautiful. Will two three-fourth-inch or one-inch cables support a wooden bridge six feet wide with a moving load of say 10,000 pounds, and will such a bridge give better satisfaction than a truss bridge?

Who manufacture wire cables?

J. W. DeFord, Winamac, Ind.

A light suspension bridge of the span mentioned can be constructed at less cost than a truss bridge of the same span to carry the same load. The difference in cost can only be determined after a detailed consideration of the cost of towers and approaches, of the sag allowable in the cable, of the stiffening necessary to make the platform steady enough to be satisfactory, so far as the suspension bridge is concerned; the cost of abutments and approaches, and the possibility of intermediate piers in the case of a truss bridge; also the moving load to be allowed for, the effect of winds between the river banks, and the relative durability of the two constructions.

The size of cables to be used will depend on several of the items mentioned.

The principal objection to the suspension bridge, if it is constructed at the minimum cost, will be the vibration of the bridge, its oscillation, and its lack of stiffness in general under the moving load and the action of the wind. If, by means of stiffening girders, stays and auxiliary cables, the bridge is made stiff enough to be entirely satisfactory, it will approximate in cost a truss bridge, and, if intermediate piers for the truss bridge are not too expensive, can easily be made to exceed that cost.

Your question can be answered satisfactorily in detail only by an engineer having a thorough knowledge of bridges, who has made a study of the practical conditions in your particular case.

John A. Roebling's Sons' Co. and the Trenton Iron Co., both of Trenton, N. J., and the Hazard Manufacturing Co., of Wilkesbarre, Pa., are prominent makers of wire cables.

THE BEST GRADE LINE FOR A SEWER.

A pipe sewer runs from A through B to C. Which will be the best grade line for the sewer, a straight line from A to C or a line broken at B, that point being above the line A C?

J. C. Postlethwaite, City Engineer, Paducah, Ky.

So far as the sewer itself is concerned, it is hardly possible to imagine conditions which would make the broken line the better. The less fall in the line A B makes the velocity less and may demand a larger pipe or produce deposits. If the gradient is very steep, the flattening in A B would be advantageous, but that seldom occurs, and when it does occur a special drop is usually provided instead of a long line, B C, so that the extra strong construction and the part subject to excessive wear is confined to the smallest possible length of sewer. It is often advisable to build on end a line as A B C, instead of A C, to save depth of trench, to get out of ground water, or other like reason, provided the difficulties mentioned above are not met with. The break at B should be made in a man-hole for convenience in inspection and cleaning.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.

ELECTROLYSIS OF PIPES—WHO IS LIABLE FOR DAMAGES?

Is there any way of legally proving that gas and water-pipes under our streets are destroyed by currents of electricity escaping from the street railway and electric light lines, and legally collecting damages from the owners or operators of these lines? Do not publish our city, because, as owners of the water supply, we expect to have to defend ourselves against excessive renewals to our pipes, needed since the trolly-lines are in operation.

President of the M. Water Co.

Employ one or two good electric engineers of known ability and standing. The legal proofs will quickly follow their tests and records made along the lines of your pipes. Samples of your pipes can be taken out and other effective means adopted which electric engineers will easily suggest. The usual affidavits, etc., must not be omitted. An honest, able lawyer and the same sort of an electrical engineer will cost nothing compared with the loss you are suffering, judging from the rest of your letter.

Electrolysis is at work to the injury of metal pipes in almost every city. Private companies are taking steps everywhere to defend themselves. But the time is not distant when the water pipes owned by cities will have to be largely and constantly replaced. To defend the interests of the city the need of able and honest technical and other employes will be greater than ever. It will be difficult to quickly and legally determine whether it is the trolly or electric light currents, and exactly which company is doing the injury, although it is generally the trolly lines which do the most damage and seldom the electric light lines. A complete prevention of electrolysis does not exist as yet, but it can be almost eliminated.

This is a field for lawyers where they can help clients get damages and do good by compelling the electric lines to be so installed as to spare underground pipes in the future. Precedent is already well established.

SEWERS ON BOTH SIDES OF A STREET.

Under wide streets would it not generally be better to have a separate sewer than to have only one? This would save expense for house connections and repairs to pavements because less pavement would be removed. I refer expressly to streets not thickly built up. I own property in new parts of Peoria. *A. M. S., Peoria, Ill.*

No general answer can be given to this question. It is a local question in each instance. It involves the relation of the sewers to be laid to the other sewers of the city and whether or not the "separate" or "combined system" of sewers are used. The proper plans and construction of sewers of every city, large or small, call for the temporary, if not permanent, employ of an educated, experienced engineer, if good and economical results are to be obtained. The above is but one of the many questions to be decided. The question represents a class where persons, apparently not familiar with the general subject involved, seek information on a part which involves the whole. Consult with your city engineer or another as your motives for desiring this information will dictate.

BY WAY OF COMMENT.

Municipal Ownership of Water-works.

The National Board of Fire Underwriters has declared itself, through its executive committee, in favor of municipal ownership of water-works, especially for cities of the first-class. The arguments from the insurance point of view are strong.

The franchise for almost any system that can be named was doubtless granted when the city was much smaller than it is at present, and the contract which would fully provide for all the necessities of the city is not elastic enough to suit the conditions of to-day. This is specially true of the portion providing for fire protection. The modern methods of constructing buildings are so recent in their beginning that no contract of the average age of existing water-works franchises could make adequate provision for the new conditions. Moreover, most of these franchises have been granted by city councils without advice from engineering or financial experts, so that they are radically defective in one or more of their provisions, and are more antiquated than they would be if the council had not possessed so high an opinion of its expert knowledge in a subject of so much technical difficulty. This is true, even of very recent franchises, for the officials of one city seldom learn from the mistakes made in other cities.

A private company is naturally striving to make the largest dividends possible for its stockholders, and it is not usually economical to increase the capacity of the works much beyond that required by the contract. In a growing city the company is likely to have about all it can do to keep pace with the increased demands, and is seldom able to remain long in advance of them. When the inadequacy of the contract is added to this inevitable tendency of the company to keep as close to the letter of its provisions as possible, the great reason for the declaration of the committee is demonstrated.

It is often extremely difficult for the city to secure a satisfactory new contract. The reasons for this are various. Many councils are beginning to think that they are not infallible in engineering matters, but do not yet know how to secure the assistance they need with certainty that they are not calling on some one as ignorant as themselves. This may be due to the modesty of the engineering profession, but is certainly due in large part to the lack of a definite and generally recognized standard of professional ability and standing. Many franchises have but a few years to run and the city is contemplating municipal ownership, but is not ready to purchase, especially if a part of the franchise period must be included in the price. Meantime the fire protection of the city must suffer. Politics often interferes. The manipulations by water-works owners sometimes delay progress.

Insurance companies themselves have been known to send incompe-

tent men to look into the methods of fire protection. Fortunately, their instructions so strongly demand that the worst possible case be made out against the city and the company that errors are usually made in reducing the value of the works below their actual capacity, rather than in giving them too high a rating.

The insurance companies frequently attempt to force the improvement of the situation by threats to raise the rates, and sometimes by actually doing so. This is always detrimental to the interests of the companies in many ways, and in view of the sharp competition in the field is seldom successful. Independent companies are too numerous to permit a permanent increase in rates.

Water-works are sometimes inadequate under city ownership, but it is almost always much easier to secure improvement than under private management. The ordinary tax-payer is very ready to have the city spend large sums for additions to the works if, thereby, his insurance rate can be reduced a few dollars a year. There are no inconvenient contracts or vested interests to delay the improvement as in the case of private ownership, and if the city is constitutionally able to raise the necessary funds, the works are enlarged. When the work is done the system is usually several years ahead of the city, rather than barely within the terms of an insufficient contract. Evidently the insurance men have strong reasons for their stand.

The Ashland Case. It seems that the supreme court of the state of Wisconsin does not coincide with the view of the Ashland case taken by the lower court. It will be remembered that a suit was brought for damages against the Ashland Water Company on account of the death by typhoid fever of a resident of the city who had used the water, and that the lower court awarded a verdict of $5,000. The supreme court does not consider the evidence sufficient to warrant the verdict, and especially objects to it on the ground that the pollution of the water was so well known that the deceased should be considered as guilty of contributory negligence to such an extent that no damage should be assessed against the water company on account of his death.

There seems to be good sense in this decision, without reference to legal technicalities. It is very difficult, if not impossible, to prove beyond a doubt that the use of the water was the cause of the fever in any particular case.

Without doubt the pollution of the bay from which the water was drawn can be seen, and may be considered serious. It may also very well be true that a general prevalence of typhoid fever in the city may very naturally be attributed to this pollution. Mistakes have often been made in such diagnoses, however, and when proof of the source of infection of a single case, among the many in the city, is desired, it is extremely difficult to find. The jury in the

lower court was certainly better satisfied with the evidence than any jury of experts that could be selected would have found themselves. A reversal or a return for new trial on this ground should not be unexpected.

But the question of contributory negligence brings in another factor which makes it still more difficult to fix the responsibility for the consequences of pollution of water supplies. It is very seldom true that a water supply becomes suddenly so polluted as to be dangerous to health and life, though the oft-quoted Plymouth, Pa., case seems to have been one of that sort. When the increase in pollution is gradual the knowledge of the fact is spread, and no one has the excuse of ignorance to present as a defense for omitting to take well-known precautions. Between the "act of Providence" or unavoidable accident and contributory negligence, the water consumer does not have much opportunity for securing verdict for damages presumed to be sustained, even with indubitable evidence as to fact.

The Yield of Wells.

The question of the amount of water which can be procured from wells and collecting galleries is one which has many parts, most of which must be answered very indefinitely. Very little attempt has been made to develop a theory by which, with certain data given, the yield may be predicted. There are so many variable quantities, some of which are subject to unexpected changes, that no theory can be applied strictly to a given case. Some valuable indications may be secured, however, which may be used to test conclusions drawn from inspections by men experienced in locating wells.

Mr. James H. Fuertes, in a recent number of *Engineering Record*, has brought together the discussions of the subject by certain European engineers, and prepared diagrams from the formula offered, from which to predict the yield of wells and galleries. He presents some results of observations of American engineers to corroborate the results obtained from the diagrams. He fully recognizes the difficulties of the case and admits the tentative nature of the results obtained. They will, however, prevent some errors which are made by those having little understanding of the theory of the flow of water in pervious soils.

The principal data needed are the percentage of voids in the gravel or sand, varying from 20 to 45; the effective size of the grains, uniform size allowing freer flow of water than sand and mixed sizes; the nature of other materials in the sand, a certain proportion of clay reducing the rate of flow, even if the percentage of voids is not materially reduced. Carriage of such obstructing materials into the cleaner gravel by the flow of the water always tends to reduce the flow of water at a rate not reducible to formula. The occurrence of

veins, underground streams bounded by less pervious materials, pockets, underground lakes with insufficient sources of supply, are all outside the field of strict application of formulas, and of very frequent occurrence.

Other data needed are the amount of reduction in the level of the ground water by pumping at various rates, to be discovered only by experience; the limit of any such reduction of level; the diameter of well or length of collecting gallery. Fortunately, a considerable variation in any of these, except the first and last, has little effect on the yield.

The practical observer may say that when he has all this data he can determine the flow of water and the probable value of a well without a formula, and this is doubtless true. A study of the principles upon which the construction of the formulæ is based will, however, add very largely to the value of the practical knowledge he has obtained.

Results of observations are lacking in this field. Engineers who have the opportunity to test wells will do their colleagues great service if they will make careful records and publish them.

Municipal Government. In an article criticising the attitude of the founders of the National Municipal League, the New York *Sun* asserts that "of all departments of government, municipal government is the most successful achievement of modern politics." The usual statement made by careful students of municipal affairs is that the most conspicuous failure of modern times is the "government of American cities." If we accept the standard definition of "modern politics," these two statements may be in strict accord. For, to the practical politician, that system of government is most successful which gives the most opportunities for him to attain his own ends, whether they are money or power for himself, his friends or his controllers. The lack of system in the machinery of city government, the want of co-ordination and co-operation between departments, the actual jealousy of departments and the consequent antagonism of officers, the division of responsibility where it should be concentrated, are due very largely to the manipulations of the practical politician to enable him to cover his tracks, and make it all but impossible to fix the responsibility for irregularities upon any person other than some irresponsible tool, put up to take the brunt of any investigation. In many cases, however, the troubles mentioned arise from actual ignorance of the needs of municipal business.

It has always been the theory of American politics that election to office carried with it all knowledge of the principles of government and of the details of its administration and the skill necessary to apply this knowledge. This idea is productive of little mischief so long

as towns are small and conditions are simple, but as the population increases, life becomes more complex, expert knowledge becomes necessary in one department after another of the city government, until, either that expert knowledge must be secured and retained in service, or the confusion so frequently observed in our cities results. Some cities have advanced in some departments of their work, but none have yet been able to throw off the yoke of the "modern politician" entirely; to rid themselves of the idea that expert technical knowledge is transferable from one alderman to his successor, or can be absorbed with the tobacco smoke of the council chamber; or to see the inherent fallacy of the principles of rotation in office and "to the victors belong the spoils."

The government of practically every American city is, therefore, extravagantly expensive, whether the disbursements are made for legitimate purposes by ignorant or careless officials, and non-expert employes, or in part for the benefit of others than the municipality by officials manipulating city funds for political purposes, or by other dishonest officials or employes.

In those departments of the administration in the more advanced cities where some sort of system has been introduced, there are always opportunities for the smart politician, or the bright rascal, to conceal his operations for some time, when the elected and appointed officials are in collusion, as frequently occurs when the local "Tammany" gets hold of the machine. It has thus been proved many times over that the best system is powerless when the voters put the practical politicians into office, and serve notice upon the practical business and professional men that they are not wanted in municipal affairs. The best machine is useless when put into careless, incompetent or dishonest hands.

The final resort must therefore be education of the voter. He is quickest reached through his pocket. A system of municipal accounts which will show what expenditures are actually made, and demonstrations of the cost actually necessary under proper conditions, will help. The reason that municipal reform has been so slow in development is to be found in the fact that the development of the riches of the country has been so rapid that it has not been necessary to look after the pennies. As we come closer to the limit of such development, we must look closer to our expenditures. The average tax-payer is beginning to inquire whether his money is being well spent. Soon he will demand answers to his inquiries. The usefulness of such organizations as the National Municipal League is largely in educating the tax-payer, in showing why he does not get satisfactory answers, and in suggesting changes in forms of city government to be put in use when

the tax-payer and voter is sufficiently educated to be able to understand the necessities of the case, and to take a hand in relieving them.

The League can do more with the same expenditure of effort for the coming generation in this line of education than in any other. For example, the teachers are usually among the more intelligent people in the community, and can be shown the need of this education more quickly than others. They, in their turn, can, in very few lessons, impress their scholars with a great respect for the value of expert knowledge and training, whether in science, pure or applied, business, city affairs or the "politics of the future." This respect, added to the knowledge of the necessities of the case, which will be forced upon the child as he becomes a man, will do much to eradicate the present pernicious principles of American politics and make him desirous of putting his municipal business on the same footing as his own business, to be conducted by men of education and experience upon business principles without fear of dismissal from office so long as the business is properly managed.

The League has entered upon a long campaign of education, and will find its best results in that line. Attempts at improved forms of government based upon theoretical considerations are very commendable, but little permanent benefit can be expected from them until the people are educated up to them. We do not have good city government because, as a whole, we do not yet want any better government than is *imposed upon us* by our party bosses, local, state, and national.

Taxation of Water Companies. The supreme court of Minnesota has decided recently that a city has no authority to make a contract with a water company to remit its taxes in exchange for a definite amount of fire protection and water for city purposes. The ground for the decision is the lack of uniformity in taxation. The company would pay no more tax when its property had largely increased in value. It is possible that a contract whereby the amount of fire protection would increase with the growth of the works or with the growth of the city would be held valid. Such a result would be secured if the company were required to put in a hydrant for each definite length of water main laid. There would be a closer approach to uniformity here, but possibly in some cases not sufficiently close to come within the requirement of the court. Many cities have similar contracts which may easily be declared void by the courts upon these grounds.

Engineering Competition. A cogent reason for the admittedly unsatisfactory position of engineers, in the opinion of city and town officials, more particularly of those whose practice is largely in public works, is

found in the unprofessional conduct of many in competition for engagements. Too many engineers fail to emphasize or even to recognize the difference between the mechanical and the professional lines, and place the entire matter upon a commercial basis solely. The average city official is originally filled with the idea that engineering skill is, like surveying skill, of the same nature as a contractor's ability and is to be secured in the same manner. The engineers mentioned, instead of combatting this idea, fall in with it, and the lowest bidder secures the engagement, provided he can show credentials indicating some ability, just as the contractor must show credentials indicating his responsibility.

The city official under discussion carries the same idea, as much as possible, into the selection of a city attorney and a city physician; but these professions are higher in the public opinion and their members are better organized, and flagrant instances of unwarranted competition and appointment of incompetent low bidders receive prompt rebuke. Engineers do not have this standing nor this organization.

The lack of organization depends upon their own failure to act and the lack of high standing depends very largely upon the failure to organize. When the engineer places his abilities on the same plane as the lawyer and the physician and makes unprofessional in fact as well as in name open competition, where price is the only consideration and the question of merit is lost sight of, he will elevate the profession in the opinions of those who control his employment, and not before.

Among architects competitions for building plans are not infrequent. But these are upon a very different basis. Here the competition is between plans, and theoretically the best plan wins. The matter of compensation does not enter into the competition. These competitions must be watched very closely to prevent departures from strictly professional conduct. Among engineers there is little opportunity for such competitions, except in the cases of bridges and buildings where architectural as well as engineering features are involved. There can be no valid objection to such a competition of wits, if properly conducted, but when the question of the compensation which will be accepted enters the competition, controlling an appointment, the boundary of correct professional conduct is left far behind. Can it be that the reason engineers refuse to consider the matter with serious purpose of improvement is that too many of them would find their present practice tabooed by the rules that they see must be laid down before advance can be made?

Engineers must do much educational work among such city officials and citizens as those mentioned, for which they can expect no compensation. There is seldom a good engineer in general practice who does not say that he must do

much work for which he receives no compensation. There is a line to be drawn through this field, however, on one side of which should lie the work which can be thus donated, in proportion to the missionary spirit of the individual, and on the other side of which will be the information, advice and responsibility which the duly selected consulting engineer only can give and assume. If he is not adequately paid for these, he and his fellow engineers are directly responsible by their lack of organization, and their failures to conform to evident professional standards of ethics, and to establish standards of professional attainment. Such a line is just as easy to draw in the field of engineering as in the field of any other profession. In the present state of ignorance concerning engineering matters, especially in the ranks from which city officials are drawn, almost the only hope for improvement in conditions is in such educational efforts of the competent engineers who have high professional and ethical standards. The shyster may be expected to misuse the privilege and to try to cast discredit upon competent engineers for legitimate use of it.

Change in Traffic Conditions. The development of transportation systems, the improvement in motive power and the increase in capacity of cars and trains has so reduced the cost of transporting merchandise that for bulky freight the cost of loading and unloading is a very material part of the freight charge. This operates against combination routes, even in competition with all-rail routes. Where the water route is long and ample, so that large vessels can be used, the modern loading and unloading devices cause the water route to retain its supremacy, even if the coal or ore must be loaded on cars, loaded into boat, unloaded and put on cars and again unloaded. But where the water route is restricted in capacity or speed, the point where the all-rail route is more economical is soon reached. An example of this is given by the proposed abandonment of the Delaware and Hudson canal and the connecting switch-back railroad. The coal mined about Carbondale has been loaded on cars and run by gravity, with stationary engines to haul trains up steep inclined planes to the head of sections of the gravity road, to Honesdale. Here it was loaded on small canal boats and hauled by horses to Rondout, where it was again loaded on large canal boats or river boats for distribution to river, canal and sea ports. It has long been true that coal destined for inland towns was delivered by all-rail route rather than suffer the additional transfer necessary on the combination route. Loading and unloading, and storage devices of the latest design have been put in use to reduce the cost of the route to the lowest possible limit, but the competition of the large car and long train is too sharp and the contest is given up. In this particular

case the traffic is limited by the circumstances to the bulky freight, and there is not trade enough to warrant the expenditure of the large sums necessary to allow the large boats of the Erie canal to pass through the Delaware and Hudson canal, so that there is no hope for a revival of the business of the route.

The same course of reasoning is true regarding the Erie canal. It was long ago found necessary to do away with the trans-shipment at Albany and Troy by towing the canal boats to New York or other parts not exposed to ocean waves. The trans-shipment at Buffalo is still a serious drawback to the route. All efforts now tend toward an enlargement of the canal sufficient to allow boats of reasonable size, which can navigate the lakes, to pass through the canal also, so that bulk will not be broken from the western lake port to the sea port, and possibly even to the foreign port. This enlargement is the only salvation for the canal as a transportation route of prominence for through business. The canal has not been a competitor for local business since the railroad system has been developed.

PERSONAL INFORMATION.

THOMPSON—Mr. Almon D. Thompson, the author of the article on "The Duties and Compensation of Municipal Engineers," which appears in this number of Municipal Engineering, has done much to aid the advancement of his profession and is widely

A. D. THOMPSON,
City Engineer of Peoria, Ill.

known as one of the most capable and progressive of the younger municipal engineers in America. He was born at Gillman, Ill., in 1868, and graduated from the college of engineering at the University of Illinois in 1893 with the degree of B. S. He received the master's degree of C. E. from the same institution in 1897. In his early engineering experience he was employed on drainage work as chainman and rodman for one year, from September, 1888, to September, 1889; was with the Illinois Central railroad on maintenance and ballast work from June to October, 1890, and was employed on general city surveying and in charge of the Belt line survey at Peoria, Ill., from May to October, 1892, and again from April to July, 1893. He entered the employ of the city of Peoria in July, 1893, as a sewer inspector. In the fall of the same year he was promoted to assistant city engineer in charge of sewers and in the following spring was placed in charge of paving work. Since May, 1895, he has been the city engineer of Peoria. He has been a frequent contributor to engineering periodicals and has taken an active interest in engineering societies. He was chairman of a special committee on standard specifications and tests for paving brick and sewer pipe of the Illinois Society of Engineers and Surveyors in 1895, which was the first committee ever appointed by an engineering society to investigate these subjects. He was chairman of the committee on street paving of the American Society of Municipal Improvements for 1896 and 1897. He was elected first vice-president of this organization at its last annual meeting. He is also president of the Illinois Society of Engineers and surveyors.

GREENE—Major-General Francis V. Greene arrived in Washington December 28 from New York for the purpose of resigning

his commission as an officer of the volunteer army, preparatory to resuming the conduct of his business affairs as president of the Barber Asphalt Paving company. General Greene was one of the foremost officers in the campaign in the Philippine islands, and later did most effective work in Havana in reforming the sanitary conditions in that city, and assisting the United States evacuation commission in charge of property interests. During a consultation with Adjutant-General Corbin Dec. 26, in regard to the condition of affairs in the Cuban capital, General Greene expressed the opinion that there would undoubtedly be trouble in the maintenance of order pending the transfer of the control of affairs from the Spanish government to the United States military authorities, but that he did not believe it would reach proportions beyond the control of the American forces. It is reported that Governor-elect Roosevelt has tendered General Greene the position of state superintendent of public works, now held by Geo. W. Aldridge, but it is regarded as improbable that he will accept the appointment.

Personal Notes.

Martin F. Fragley has been elected superintendent of streets at San Francisco, Cal.

W. A. La Fountain has resigned his position as street commissioner of Fulton, N. Y.

Benjamin C. Brown has been re-elected superintendent of the water department at Woodbury, N. J.

William Mahlon Davis has been appointed city engineer and superintendent of water works at Berlin, Ont.

J. H. Mabbett has been appointed water commissioner at Saratoga, N. Y., to succeed Mark M. Cohn, deceased.

Gillett Gordon has succeeded Daniel Castleman, resigned, as superintendent of water works at Connersville, Ind.

Bernard M. Shanley has been elected president of the Essex & Hudson Gas Co., a newly formed company in Newark, N. J.

Edward M. Boggs, civil and hydraulic engineer, has beeen elected a member of the Chamber of Commerce at Los Angeles, Cal.

George Richardson, for many years supertendent of the private water works plant at Bridgeport, Conn., died Dec. 12, aged 51 years.

Chas. P. Chase, city engineer at Clinton, Ia., has been directed to prepare plans, specifications and estimates for the improvement of the levee.

Joseph F. Haas has beeen elected clerk of the Sanitary District of Chicago, Ill., to succeed James Reddick, who has been elected clerk of the probate court.

William Jackson, M. Am. Soc. C. E., city engineer of Boston, Mass., has returned from Europe. While there he collected in the interest of the design of the new Cambridge bridge considerable data regarding bridges in continental cities.

Samuel M. Gray, M. Am. Soc. E., Providence, R. I., has been engaged as consulting engineer for the proposed street paving in the city of Petersburg, Va.

Thomas W. Grant of Shenandoah, Pa., died Dec. 1. Mr. Grant had been interested in street paving in the City of Mexico and in the reservoir contracts in Philadelphia.

Chas. P. Costello, Portland, Me., has been appointed superintendent and general manager of the water works at Springfield, Mo. The works are controlled by eastern capitalists.

Willard A. Smith, Chicago, Ill., has been appointed director of the department of transportation and civil engineering of the United States commission to the Paris exposition.

F. W. Cappelen, city engineer of Minneapolis, Minn., has been elected as the referee in the test of the new pump which has been installed in Chicago by the Lake Erie Engineering Works.

Samuel McElroy, M. Am. Soc. M. E., Brooklyn, N. Y., died of heart disease Dec. 9, aged seventy-four years. Mr. McElroy had long been identified with the board of public works of Brooklyn.

John Caulfield, secretary of the water board, St. Paul, Minn., delivered an address at the Commercial club of that city Dec. 5 on "The St. Paul Water Works and Its Value to the Community."

George Tisdale Clark, a member of the board of arbitration to determine the price to be paid for the water works plant of the private water company at Fulton, N. Y., died at Oswego, N. Y., Dec. 9.

Arthur J. Cox has resigned his position as city engineer of Iowa City, Ia., owing to the failure of the paving committee to properly back him in an effort to compel a contractor to live up to a contract and specifications in a paving contract.

James G. Lindsey, superintendent of the Newark Lime and Cement Manufacturing company, died at his home in Kingston, N. Y., Dec. 5, aged 80 years. Mr. Lindsey was an able geologist and an authority on the cement-bearing rocks of New York.

Henry B. Looker has been reappointed district surveyor of the District of Columbia. William P. Richards, who succeeded Mr. Looker as surveyor when he resigned that office to accept the command of a company of volunteers, has been reappointed engineer in charge of street extensions.

John T. Pennington, bookkeeper for the Springfield Paving Brick company, Springfield, Ill., was robbed of $220 recently while on his way to the plant to pay the employes. He had $600 on his person. He was accompanied by Engineer Staley, and when near the city limits a negro confronted them, knocked both men down with a club, secured the money and fled.

Lieutenant Colonel William M. Black, Corps of Engineers, U. S. A., has been assigned to duty in the office of the chief of engineers in the war department, in charge of the division of personnel and fortifications, to succeed Major Joseph E. Kuhn, who has been summoned to Leavenworth, Kas., owing to illness in his family. The position to which Mr. Black has been temporarily assigned is one which he held when he was appointed Engineer Commissioner of the District of Columbia.

CURRENT INFORMATION.

Street Cleaning and Sanctification.

The sanctifying influence of cleanliness is illustrated by the frame of mind into which the people of Detroit have worked themselves since Commissioner Moreland has had his "white wings brigade" hovering over the city. The case is stated pretty strongly in a recent article in the Detroit Free Press, but it is characteristic of Detroit that the people there know no middle ground between nothing and the extreme. The article leads the reader through all the agonies of the passing of a reformer, and concludes the flight as follows:

The Soul of the reformer stopped. "Surely," it said, "this is the Celestial City of my earthly dreams—the city of purity, and cleanliness, which is next to godliness."

And it turned, did the Soul, and spake unto a man who passed.

"Tell me," it said, "this is heaven, is it not?"

And the face of the man questioned broke into a smile of great happiness, and he made reply, "Nay, it is not heaven."

"Not," repeated the Soul of the great reformer with amazement. "Then what city may it be?"

And quietly the other made reply, "It is Detroit." And he passed on his way.

This will surely settle all doubts in the minds of President Moreland and his associates as to their reward for the trials and sufferings they have endured in their efforts to save Detroit in spite of itself.

Settlement of the Chicago Sanitary District Controversy.

A final settlement has been effected in the controversy between the Chicago sanitary district trustees and the state canal commission by a decree of the court. The provisions of the decree vindicate the position of the canal commissioners from the start, and every point claimed by them at the beginning of the trouble is conceded.

The decree, as approved by both boards, compels the sanitary district to comply exactly with the provisions of the contract of March 11, 1898. This contract provides that the sanitary district shall forever maintain all construction where the drainage channel crosses or is merged with the canal.

The provisions of the settlement require the sanitary district to build and forever maintain a steel bridge 600 feet long across the entrance of its channel into the upper basin; to build a boom at this entrance; to raise the towpath on the west side of the canal for about 4,000 feet two feet; to rebuild lock No. 5 and the gates thereat; to build a permanent stone embankment from lock No. 5 to the present guard lock; to reconstruct dam No. 1 entirely on plans agreed upon; to reconstruct a tail race around dam No. 1; to construct a by-pass at lock No. 1; to build new waste gates on the Channahan level. The canal commission is given the right to construct and maintain tail races upon any lands the sanitary district owns or may own in Joliet. This is to guarantee an outlet for the tail races for water power on the Channahan level. The sanitary district is to save the state harmless from any damage which lessees of the state may sustain or may have sustained by reason of the construction of the drainage channel.

This litigation has been of great interest and sixteen expert engineers have been engaged on the case, including John T. Fanning of Minneapolis, George W. Rafter, Rochester, N. Y.; Geo. Y. Wisner, Detroit; Geo. H. Benzenberg, Milwaukee; John Bogart, New York; Wm. Sooy Smith, Chicago, and others. The engineering questions involved were the navigation of canals; flow over broad-crested dams of large volumes; water powers; tests of water wheels; flow in irregular channels; hydraulics of canals, floods and levees, and many other points involved in the attempt of the sanitary district to pass 1,500,000 cubic feet per minute across the canal over the state lands and pass its water power right and leases. The engineering testimony covered over 3,000 pages of type-written matter and occupied five weeks of time.

Pollution of Passaic River.

The River Pollution Commission has issued a circular to citizens of all the municipalities affected by the present condition of the Passaic river. The formation of a committee of from three to seven members in each of the affected localities to consider the various phases of the problems now before the commission, with the ultimate purpose of holding a general conference with the commission at a time and place to be agreed upon later, is suggested. A trunk sewer carrying the sewage of all the districts of the Passaic river to a single place of disposal, as advised in the report of the former commission, and the separate treatment of the sewage of each municipality are favored.

Consolidation of Street Lighting Companies.

A combination of street lighting companies east of the Mississippi will go into effect January 1, involving the following: Pennsylvania Globe and Gas Light Co. and Welsbach Street Lighting Co., Philadelphia; New York and New Jersey Gas Light Co.,

New York; Chicago Globe and GasLightCo.; Canton Globe and Gas Light Co., Canton, O.; Kitson Incandescent Gas Light Co., and two other companies not named. All of these companies, except the Kitson, are controlled by the Pennsylvania Globe and Gas Light Co., of which the stock is owned and controlled by the United Gas Improvement Co., of Philadelphia, or the Widener-Elkins-Dolan syndicate. The consolidation carries with it four large factories and 60,000 lights in different cities, soon to be increased by 50,000 lights contracted for by the Kitson Co. The Welsbach Co. is operating in fifty different towns. The cause of the consolidation is an alleged infringement of gas light patents by rivals of the Pennsylvania Globe and Gas Light Co.

Inquiries Regarding Street Paving.

A committee was appointed recently at Hamilton, O., consisting of Israel Williams, E. B. Rogers and Christian Weiss, which formulated and set out a list of printed questions to about 100 cities where street paving exists and is in progress, in Ohio, Indiana, Illinois, Iowa, Missouri, Michigan, Pennsylvania, Kentucky, West Virginia and New York. The information particularly desired in these questions related to brick, sheet asphalt, block and macadam paving. Answers were received from seventy-five cities, showing that the cost of brick paving ranged from .78 to $1.98 per sq. yd., according to foundation and character of work; asphalt from $1.30 to $2.12, and cedar block, $1.34. The committee reported that from the corrrespondence there seemed to be very little differenc in the construction of foundations for all the kinds of pavement in use, the usual construction being of concrete or gravel about 6 ins. in thickness, with a top layer of sand when the paving is of brick or asphalt block.

Pavement Guarantee Held to Be Illegal in Kentucky.

In an action brought recently to enforce a lien for a street assessment the owner of certain lots urged that the improvement of the street with vitrified brick was not necessary or beneficial to the city, nor to the lots along said improvement; that there was very little or no traffic upon the street, which was near the line of the city; that said improvement was two or three times as expensive as the improvement of other streets in the same vicinity, and which were in a more populous part of the city; that the ordinary limestone pavement there would have answered every purpose, and would have been not more than half so expensive; that the cost of the proposed improvement was so excessive that the proportion thereof chargeable to certain of the lots would fully equal the existing value of the same, and would approximate the value of the other lots. The court of appeals of Kentucky held that the amount charged to these lots was not so much as to amount to a spoliation or confiscation of the property, and that, as to the propriety or necessity for the improvements in question it was sufficient to say that the law seems to be well settled that the city government was the sole judge of the necessity of such improvements. But, it further appeared that, as part of the contract, the contractors were required to keep the street in repair for five years, and 10 per cent. retained as a guarantee or security for the faithful performance of that undertaking, which stipulation in the contract, the court holds, was illegal and not enforceable against the property-holders. The court reversed the original judgment and orders one entered for only 90 per cent. of the amount apportioned or charged to these lots.

Printers' Ink as an Aid in Street Cleaning.

The Detroit board of public works has issued a handsome calendar for the year 1899, of which 1,000 copies will be distributed among the business men of Detroit. At the top of the calendar appears the picture of Moreland's "White Wings brigade" (which was published in the December number of Municipal Engineering), with the request, printed in conspicuous type, "Kindly assist us in every way possible in keeping the streets and alleys of our city clean." The idea is President Moreland's. When the calendars appeared Commissioner Kallman asked, "Who is going to pay for these?"

"Why, the city is, of course," replied Mr. Moreland. "They'll pay for themselves. I believe in moral suasion and education," he added. "Ask the business men not to throw paper and waste on the streets and most of them will comply cheerfully. It'll make less work for the white wings, and the streets will be neater. We sent a circular to the business men calling their attention to the matter, and I know it did lots of good. Now, this calendar will be hung up in business offices, for it's pretty and useful, and it will constantly remind people about the matter of clean streets. Most of our trouble has been with business houses that dump loads of waste paper on the pavements; but I think they will stop it if we educate them a little. These calendars will accomplish more to-

ward keeping the streets clean than hauling the offenders into the recorder's court would."

A Sample of Steel Roadway.

A steel roadway, about 150 feet long, is being laid at the Minnesota Agricultural Experiment Station. The steel rails are 8-ins. wide with half-inch flanges at the outer edge and are 30 feet long. They are made of quarter-inch steel, with cross-ties every six feet buried about a foot. On the ties are timber strings on which the rails lie. The width of the 8-in. rails takes in wagons on any width of tires. This demonstration of the steel roadway is being made in order to try to show its advantages over the ordinary macadamized road. It is asserted that such a road costs $2,500 a mile, while a macadamized road costs from $3,000 to $6,000, and that the steel road will outlast the macadamized and be far more serviceable.

Illegality of Alternative Specifications.

A decision was rendered recently by Judge Rufus B. Smith of the superior court of Cincinnati, in the case of Frederick Hertenstein and other tax-payers vs. the board of water works trustees of the city of Cincinnati. The trustees, having in contemplation the grading of certain grounds, roads and certain portions of the river bank of the Ohio river, the revetment of certain slopes and the excavation of a certain clear well, as a part of the construction of a water works system for the city of Cincinnati, advertised for bids for said work according to certain plans in their office. The bids were referred to the engineer for computation, who reported that if riprap and seeding were used, C. A. Phelan would be the lowest bidder, his bid, under such conditions, amounting to $96,733.60; but if dry paving and sodding were used, the David Folz Asphalt Paving company would be the lowest bidder, its bid, under such conditions, amounting to $109,381.80.

The explanation of this peculiar result is found in the fact that items 16 and 17 of the specifications call for dry paving or riprap, and items 18 and 19 call for sodding or sowing in grass, and that the bid of Phelan was the lowest on the items of riprap and sowing in grass, while the bid of the David Folz Asphalt company was the lowest on the items of dry paving and sodding. Subsequently the board concluded that it would use a greater quantity of dry paving and sodding than it would use of riprap and sowing in grass, and thereupon awarded the contract to the David Folz company. The plaintiff's main contention was that the action of the board in awarding the contract to any one was illegal and void for the reason that the specifications were illegal.

Section 7 of the water works act provides that:

"Said commissioners in constructing such works or such enlargements, extensions, improvements or additions, shall also have power and authority and be governed in respect of contract as follows:

"Said commissioners shall before entering into any contract cause plans and specifications, detailed drawings and forms of bids to be prepared and careful estimate of costs to be made; and when adopted by them they may, in their discretion, cause the plans and drawings to be multiplied and printed, by photographing, lithographing or other suitable process, and specifications and forms of bids, contracts and bonds to be prepared, and have the same printed for distribution among the bidders." It is further provided that: "Said commissioners shall not enter into any contract for work in the construction and completion of said water works system without first causing thirty days' notice to be given in one or more newspapers of general circulation in such city; that sealed proposels will be received for doing the work or furnishing the materials."

Judge Smith believes the proposition to be beyond dispute that the preparation of plans and specifications of the work to be done is a vital condition of the entering into any contract by the commissioners with respect to a work of this magnitude. He says:

"It is contended that the board may advertise in the alternative form as to various classes of work to be done and materials to be furnished and after the bids are received it may then finally determine what its specifications will be and award the contract to that bidder whose bid is found to be the lowest for the work according to the specifications adopted after the bids have been received. Such was the course pursued in this case. I am of the opinion that such a course violates both the letter and the spirit of the law. It violates the letter of the law because the law expressly requires that the specifications shall be adopted before the bids are called for, and it violates the spirit of the law because it opens the door to favoritism and fraud by enabling a board, after the bids are received, to adapt the specifications to meet the bid of a favorite bidder. It is no answer to this position to say that the board may be ignorant of the cost of the different kinds of work it may contemplate until it receives bids for the same, and therefore ought not to be compelled to adopt a plan which in the end may prove to be the most expensive; because the board has power to employ engineers and such other employes as they may deem necessary to assist them in determining such questions, and furthermore has the privilege of rejecting all bids if it deems it best to do so. If, therefore, its engineers have not advised it wisely it may reject all bids and prepare new specifications until it is satisfied that it has secured the best and most eco-

nomical plan. The injunction prayed for in this case is allowed."

President Herrmann of the water works commission says the commission "will not contest the opinion of Judge Smith, for it is apparent that in that contract we made a mistake. The point never occurred to any of us. We shall prepare new specifications and readvertise the contract." Mr. Herrmann does not believe, however, that any illegality exists in the other contracts awarded in the water works construction, for the commissioners specified exactly what they wanted in them.

Crude Oil on Country Roads.

Major M. Meigs, a civil engineer of Keokuk, Iowa, reported recently at the Missouri Good Roads convention, held in St. Louis, that he has been using crude oil on muddy highways by which he has succeeded in keeping them in such good condition that they have attracted wide attention. Major Meigs' attention was first directed to using oil on the highways by reading a newspaper clipping from a Pennsylvania town. It seems that a leaky oil pipe near a place in the road that was invariably impassable during the season of spring and fall rains, saturated the ground to some extent with oil. It was noticed very soon that the mud dried up and the surface of the earth became hard and remained so. The piece of road was so notoriously bad that the effect of the oil on it became a matter of much comment and the experiment was repeated in other localities with the same effect. Major Meigs sent a letter to the officials of the Standard Oil company and asked them to furnish him some crude oil for experimental purposes. A tank containing 130 barrels was forwarded with their compliments and wishes for success. About eight barrels of this oil have been used on a notoriously muddy road near Keokuk with satisfactory results. A barrel of crude oil is sufficient for a road 100 feet long and twelve feet wide. The cost of the oil at the wells is about 90 cts. a barrel.

Street Paving in New Orleans.

At a meeting of the Louisiana Engineers' Association Dec. 12, A. C. Bell, city engineer of New Orleans, read an interesting and instructive paper giving a history of street paving in that city. The first street paved was in 1817, when one square of Gravier-st. was paved with cobble stones, the material being brought by sailing vessels as ballast. This paved street proved such an improvement over the unpaved ones and demonstrated that the streets could be paved, notwithstanding the yielding nature of the soil, that in 1820 the wooden sidewalks and curbs on the main thoroughfares gave place to others of brick and stone. In 1822 a general paving of the principal commercial streets in both the old and the new town was begun. The experience was so satisfactory to the public that the city council passed an ordinance Sept. 22, 1827, for the paving of the streets and the making of sidewalks in the city and its incorporated suburbs. In order to determine the relative merits of street paving materials, an ordinance was passed Feb. 27, 1838, providing that St. Charles-st. be paved in the following manner: One-third in stone blocks, one-third in curbstone laid flat, one-third in hexagonal blocks of pine wood. During the period from 1827 to 1880 the character of the pavements laid was planking laid on stringers, shells, cobblestones, flat stone, square blocks and wooden blocks. Shells were used on the roads in the suburbs and the other materials in the urban part of the city where traffic was heavy. The Cotton Centennial, held in 1885, at what is now Audubon Park, forced upon the city the necessity of paving St. Charles-ave., the only means of access for vehicles to the Exposition grounds. Asphalt was the material selected, and its durability, smooth surface and excellent sanitary qualities found favor at once with the public, and its use has continued to the present time. Street paving in New Orleans is carried on by special assessment levied on the abutting property—three-quarters in ordinary streets and two-thirds in neutral ground streets, the city paying one-quarter and one-third respectively and the intersections. In the matter of repaving streets the council can order the work done at the cost of the city. The legislation is by petition, signatures of property-owners to the amount of one-quarter of the total foot frontage being required. Protest requires the signatures of a majority of property-owners by foot frontage. The council can, by a two-thirds vote, require the paving of a street, the cost to the city and property-owner being prorated as above, according to the character of the street, whether ordinary or neutral ground streets. Mr. Bell regards a testing laboratory a very essential part of the equipment of any municipal department having charge of the construction of public works.

Another Eastern City to Be Made Greater.

A bill will be submitted to the New Jersey Legislature providing for the Greater Newark. As outlined, the greater city is to have a population of about 400,000, an

area of 65 square miles and will take in more than half of Essex county. The plan provides for wiping out entirely the municipal governments of Orange, East Orange, South Orange, Vailsburg, Bloomfield, Montclair, Belleville, Franklin, Irvington and Clinton and will include a large portion of the townships of West Orange and Millburn and part of Verona and Livingston.

Discussion of Municipal Problems.

The sixth annual conference of the National Municipal league was held in Indianapolis Dec. 1, 2 and 3. In a paper on "The Municipal Problem in the United States" Horace E. Deming of New York City said the two principal causes of the failure thus far in the United States to secure efficient, economical, progressive municipal government are:

"1. The municipality is not granted sufficient power to determine for itself all matters of local public policy and to settle for itself the details of its scheme of internal local administration.

"2. The municipality as a subordinate administrative agent of the state is placed partly or wholly under the supervision and control not of any state administrative department, but of the state legislature.

"The cities have been governed from without, not from within; such governmental powers as they may have are not exercised by methods and agencies selected by their own citizens, but according to the theories of outsiders. They have not been self-governing communities free to apply their own remedies to their own ills, and, taught by experience, to work out an administration adapted to their local needs."

As a remedy he proposed the following:

"1. The municipal corporation should be invested with the governmental powers requisite to determine all questions of local public policy. There should be no excuse, and, if possible, no opportunity to apply to the legislature for additional powers, and, on the other hand, the legislature should have no excuse, and, if possible, no opportunity to intermeddle with the local government by granting or taking away any power to enable the city to decide for itself any question of local public policy.

"2. The citizens of the municipality, under general laws, should be free to make and amend their own form of municipal government, provided it be based upon democratic-republican principles, and to determine their own methods of administration of the local governmental powers, according to their own ideas as to what will best satisfy their local needs.

"3. In so far as the municipal corporation is made the agent of the state to enforce and administer general laws within the corporate limits, it should be under the supervision of and responsible to central state administrative departments, and not subject to the sport of special legislation.

"A municipality thus constituted is not an imperium in imperio, but a free, self-governing community, subject to state administrative supervision as to all matters of general state policy to be enforced throughout the state. Legislative interference is eliminated. Home rule is not only possible, but compulsory."

In the absence of Dr. F. J. Goodnow of the Columbian university, George W. Guthrie of Pittsburg read his paper on "The Place of the Council and the Mayor in the Organization of Municipal Government—the Necessity of Distinguishing Legislation from Administration." He said:

"With the development of new fields of governmental activity, which require for their advantageous treatment large technical skill and knowledge, and with the development of a more centralized administrative system, which offers no excuse for treating administrative officers as political in character, the fundamental principle that administration is a field of government in which politics should not enter is making steady progress. Public opinion based upon that principle is demanding with increasing force that in municipal government, which is so distinctively administrative, the function of legislation—i. e., the function of determining policy must be clearly distinguished from the function of administration—i. e., the function of carrying out policy after its determination, to the end that municipal administration may be efficient and municipal legislation may consist in the determination of a local policy representing the wishes of a majority of the municipal population."

Some of the other papers presented during the conference were: "The City in the United States—The Proper Scope of Its Activities," Dr. Albert Shaw; "Municipal Franchises," Charles Richardson, Philadelphia. Dr. Albert Shaw, in his paper on "Municipal Franchises," said:

"If I were asked to characterize in a single sentence the broad distinction between the history of the last thirty years of municipal government in Europe, on the one hand, and America, on the other, I should say that in the United States we have been making and unmaking municipal charters, and meanwhile administering them as badly as possible, while in Europe they have been bending their energies to the work of administering progressively and well such charters as their cities found provided for them in the general statutes. In other words, we have been making, marring, unmaking and repairing municipal mechanisms, while the people of European cities have beeen using their municipal machines to accomplish results in the way of an improved life for their people. I do not mean to say that the conditions of life are more advantageous for the average man today in European towns than in our own. On the other hand, I am entirely prepared to assert that almost all the natural advantages belonged to us, and that if our municipal governments had been anything like as relatively efficient as those of the European towns, the results achieved by us would have been vastly ahead of those that the best towns in England, Scotland and Germany have been able to secure.

"The tendency in European countries

has been, while prescribing the general form of municipal government and making that form familiar, identical and permanent, to give each individual community in matters actually concerning the life of that community alone, a very wide range of liberty in determining for itself what from time to time should be the diminished or expanded scope of its functions."

The plan of the next conference will be decided at a meeting of the executive committee in February. A resolution was passed referring back to the program committee the model charter reported, to complete it for prsentation at the May meeting of the National Municipal League. Another resolution provided for investigation of a uniform system of accounting in municipal utility plants.

Liability for Supplying Polluted Water.

The supreme court has rendered a decision in the case of Julia Q. Green, adm., vs. Ashland Water company, Ashland, Wis. This suit was brought to recover from the water company for her husband's death, on the ground that it had neglected to extend its intake into Chequamegon bay from time to time to obtain unpolluted water; that on account of this negligence the deceased took from the faucet at his home water containing the germs of typhoid fever, which caused his death. The jury, in the trial court, awarded the plaintiff $5,000 damages, from which the company appealed.

The supreme court upholds the decision of the trial court—that the company's franchise did not require it to go outside of Chequamegon bay for a water supply. Nearly a year prior to the death of Green the officers of the city and water company were of one mind as to the necessity of going outside the bay to get water suitable for domestic use. A report was adopted in February, 1893, to direct the company to extend its intake so as to draw water from the lake rather than the bay, and in April such a resolution was adopted and an attempt was afterward made to condemn the water supply and annul the department's franchise because it did not go into the lake with its intake. The supreme court considered it clearly established that all parties understood for nearly a year prior to Green's death the bay water was unsuitable for domestic use. During this time there was a contest between the municipality and the company as to whether the latter was obliged to extend its intake to the lake. This being the situation between the primary parties to the contract, the Supreme Court rules that the situation "could not be different as to private persons who became parties thereto, by claiming the benefit of the contract." The decision further reads: "The verdict of the jury on the point here considered appears to be contrary to the evidence, and if a recovery on the record depends on that question the verdict should have been directed for the defendant and the judgment appealed from cannot stand. Suffice to say that the proof is overwhelming to the point that the bay water was dangerously polluted at the time Green was stricken with the fever, and that it had been in that condition, especially in the spring, for several years. The facts in that regard were understood in the city generally and had been the subject of discussion at public meetings and in the City Council and in newspapers, and among the people for a long time. There is no evidence in the record about the presumption that deceased had notice of what was so commonly known. So we cannot escape the conclusion that the verdict of the jury on subject of Green's contributory fault is without evidence to support it, and that the contrary is established by the evidence. For this and the other reasons mentioned the judgment appealed from must be reversed."

Technical Meetings.

The annual meeting of the Brooklyn Engineers' Club was held Dec. 8 at Brooklyn, N. Y., and officers for the ensuing year were elected as follows: President, Walter M. Meserole; vice-president, Henry B. Seaman; secretary, A. J. Provost, jr.; treasurer, Calvin W. Rice.

The fourth annual meeting of the West Virginia Society of Civil Engineers and Architects will be held at Charleston, W. Va., Jan. 19-20.

The fourth annual meeting of the New Jersey Sanitary Association was held at Lakewood, N. J., Dec. 9 and 10. A paper was expected from Rudolph Hering, M. Am. Soc. C. E., on "Methods of Sewage Disposal," but, as he was unable to attend, James H. Fuertes, M. Am. Soc. C. E., presented a paper on the same subject. Mr. Fuertes also presented a paper on "Public Water Supplies and the Prevention of the Pollution of the Same." He said that some authorities hold that cities should own the whole drainage area from which their water supply comes. This is generally impracticable for large cities. Some English cities having such ownership do not show, by their typhoid statistics, any advantage over Boston or New York. The securing of a strip of land on the shores of reservoirs, lakes or streams used as water supplies is a practicable and valuable measure. It excludes sources of pollution from close proximity to the water. The drainage of county roads is sometimes kept out of surface supplies abroad, but he knew of no such practice here. In New York the state board

of health, on application from local authorities, formulates rules for the sanitary protection of public water supplies, varying the rules to suit each case

The Indiana Engineering Society will hold its annual meeting in Indianapolis Jan. 24, 25 and 26. A paper will be presented by John W. Hill, C. E., of Cincinnati, on "Purification of Public Water Supply."

The twenty-first annual meeting of the Illinois Clayworkers' Association will be held at Peoria, Ill., Jan. 17 and 18. Some of the subjects for discussion are: "Drain Tile for High or Rolling Land," H. C. Patton, Flanagan; "Clayworking a Century Since and Now," H. M. Baldridge, Illiopolis; "The Dryer," D. V. Purington, Chicago; "Making Paving Brick, Not Cheap, But Good," F. Plumb, Streator; "The Future of Clay Products," G. A. Tompkins, Avon. G. C. Stoll, Secy., Wheaton, Ill.

The thirteenth annual convention of the National Brick Manufacturers' Association will be held at Columbus, O., Feb. 7-10.

The next meeting of the Iowa Brick and Tile Association will be held at Sioux City, Ia., March 1 and 2.

The annual meeting of the Iowa Engineering Society will be held at Iowa City, Ia., Jan. 18 and 19, 1899. E. P. Boynton, secy., Cedar Rapids, Ia.

Cement-Testing Laboratories.

The Engineers' Club of Philadelphia held a meeting Dec. 3. The paper of the evening was by R. W. Lesley, on "Cement and Cement Testing Laboratories," in which he called attention to the fact that cement is made in one place and tested at another. The article tested is the cement which leaves the mill, the water which is used by the tester, the sand which is used by the tester, and the personal equation of the tester plus the personal equation of his laboratory in combination. He told of some thirty or forty possible causes whereby this manufactured test-piece may be injured during the process of its preparation or by its treatment thereafter and before it is tested. This was illustrated by a table prepared by Prof. J. Madison Porter, showing different treatments and results obtained upon a single sample of cement in nine different scientific laboratories. He drew a clear distinction between the well-equipped, skillfully-operated and technically perfect laboratories of the European governments, as well as some of the American public and private laboratories and the ordinary testing laboratory in use in the field and the work of most of the great American engineering constructions where conditions do not admit of the same elaborate equipment and delicacy of manipulation as are found in the European testing laboratories. He said that there is but one answer as to how cement shall be tested, and that is that there shall be distinct differences made between the specifications for cement to be tested in the ordinary laboratory on public work and cement to be tested in the perfectly equipped laboratory of the skilled expert.

Government Control of Municipal Franchises.

An order was issued by President McKinley, Dec. 23, requiring all grants of franchises, steam and street railroads, telegraph and telephone lines, water, gas and electric light companies in Cuba to be approved by the secretary of the war before they become effective.

Alleged Attempts to Bribe Aldermen.

In the suit brought by the Lafayette Bridge and Iron company of Lafayette, Ind., against the city of Streator, Ill., evidence has been offered charging an attempt at bribery on the part of the bridge company among the aldermen. Alderman Dawson testified, Dec. 21, to having received $500 from the company, and Dr. Jennings, alderman, stated positively that he had been approached and offered $500 for his vote, and when he refused this he was again approached and offered $1,000, but he refused to sell at any price.

A New Street Lighting Plant.

Chicago has just erected a new plant at Rice and Lincoln-sts., to supply current for the street arc lamps in the northern and northwestern parts of the city. The nightly load is now 866 arc lamps of 2,000 c. p. each, burning about 11 hours at this season of the year. The building, which is several years old, is of brick and consists of a single-story boiler and engine-room with provision for coal storage. The floors are of concrete and the stack is of brick, 100 feet high, and octagonal in shape. The boiler-room equipment consists of four tubular boilers of 100 h. p. each, equipped with automatic stokers, one 500 h. p. water-tube boiler and two 1,000 h. p. siphon condensers and the boiler-feed pumps. Two vertical compound-condensing engines drive directly on a countershaft extending the entire length of this room. The engines are rated at 600 h. p. each. The dynamos, at present eight in number, are belted to ...s shalt on each side. Three friction clutches

are placed on the shaft, one at each engine and one in the middle, enabling either engine to drive its adjacent half of the shaft or the whole line. Five of the dynamos have a capacity of 150 lights and the other three are of 100-light capacity. The leads to the switchboard are laid in iron pipe under the floor and all the out-going connections from the board are underground. The white marble switchboard is arranged for ten dynamos and ten circuits, providing for entension. The lamps used have single carbons 14 inches long and five-eighths inch in diameter.

A Municipal Rock Crushing Plant.

The output of the municipal rock crushing plant, which has been in operation at Burlington, Vt., since the beginning of October, was, during the first five weeks, 838 tons of screenings, 948 tons of 1-in. stone, 791 tons of 1½-in. stone, 209 tons of 2-in. stone and 13 tons of tailings, making a total of 2,799 tons and about 850 tons of crushed stone at the quarry. The items of expense for this time were: Pay rolls, $1,542.10; repairs, $20.68; coal, $106.65; sharpening drills, $25.53; new jaws and toggles for crusher, $122.51; oil, $32.19; dynamite, $18.60; carriage hire, $3.50; lumber, $2.20; royalty, $195.48; total, $2,068.84. The cost of the stone to the city during this time was about 54 cts. a ton. The price generally charged for the same material by contractors had been $1 a ton.

Street Paving in Detroit in Winter.

The paving of Congress-st. in Detroit with brick during the last month has been prosecuted under extremely adverse circumstances. Ten inches of snow had to be dug away to reach the concrete foundation, which fortunately was completed before the stormy days set in. After the brick surface was laid steam was blown between the layers to free them from snow and ice. Then came the tar binding and finally the steam dried sand. The results of this work will be watched with interest hereafter. The delay in finishing the work until the severe weather of winter had set in was due to the conflict last summer between the board of aldermen and board of public works regarding paving brick specifications.

New Publications.

The Action of Materials Under Stress or Structural Mechanics, comprising strength and resistance of materials and elements of structural design, with examples and problems. Charles E. Greene, A. M. C. E., Professor of Civil Engineering, University of Michigan, Consulting Engineer, Author and Publisher, Ann Arbor, Mich., 268 pp.

Professor Greene is one of the few writers of technical books, who is at the same time master of his subject and a master of English. He is able to put his material into the most compact form, without any sacrifice of clearness. The present volume is additional evidence upon these points. His old students will recognize much of the work as that presented by the professor in his class room and will see by the new material that instruction in the University keeps pace with the advancement in engineering practice. While a knowledge of calculus will materially aid in the study of some sections, the book will be a valuable one for those not provided with it. It is valuable to the engineer who has gone over the ground as a concise and well arranged statement of the problems and their solution, to which easy reference can be made upon occasion. The sixteeen chapters treat of the action of a piece under direct force, materials—wood, metal, stone, brick—beams, torsion, moments of inertia, flexure and deflection of beams, supported and continuous, pieces under compression and tension, safe working stresses, internal stress, rivers, pins, boilers, pipes, domes, plate girders, earth pressure, accepted designs for details in wood and iron. Practical examples such as may be found in actual work are given. As a text book and as a reference book it should be very satisfactory.

American Cements, By Uriah Cummings, 29[illegible] pp. Published by Rogers & Manson, Boston, Mass.

Mr. Cummings is a manufacturer of natural hydraulic cement, or rock cement as he terms it, and seems to have written this book to make a special plea for this class of cements. It contains considerable information concerning the methods of manufacture of a few of the best known of American natural cements and considerable discussion of the relative value of the natural and Portland cements. It is rather unfortunate that it fails to present data to confirm the statements made. The author will find many sympathizers in his attack upon the vicious principle of demanding high short-time tests of cements, especially Portland cements, most of whom will regret that he has not fortified his case with more definite, detailed and full statements of the facts which have thus far been observed. There is no apparent reason for admittting to his series of descriptions of cement works one artificial Portland cement factory and omitting others, or of omitting entirely those manufacturing so-called Portland cement from the natural rock by special processes. For example, the only reference to the works in the Lehigh Valley is that cement manu-

STREET PAVING IN DETROIT IN WINTER.

facture in that district has assumed larger proportions. There is room for one or more books on this subject which will take up the descriptions of processes and products, the statements of results, the discussion of specifications and tests, both with reference to natural cements and artificial and natural Portland cements, if they can be written in a strictly judicial spirit and present the full data from which conclusions are drawn.

The Blasting of Rock in Mines, Quarries, Tunnels, etc. By A. W. and Z. W. Daw. Published by Spon & Chamberlain, New York.

The aim of this work is to give the engineer, miner and quarryman a correct theory of rock blasting and to serve as a manual. The work is based on experience, and, therefore has the value of being reliable in its practical applications of principles, as well as in its rules and formulae for the necessary calculations, information on explosives, fuses, etc. A number of tables are added to facilitate the calculations. Especial attention is directed to how the greatest economy may be attained in the boring of holes and consumption of explosives. The present volume deals with principles and their application, and a later volume will be devoted to appliances and methods.

Annual Report of the Smithsonian Institution for 1896. Illustrated; 727 pp.

This volume contains many very valuable scientific papers, some of which will particularly interest our readers. Among these may be mentioned: "The Fundamental Principles of Mathematics," by Dr. Leo Koenigsberger; "New Researches in Liquid Air," by Prof. Dewar; "Color Photography," Otto Weiner; "Electrical Energy," Louis Duncan; "The Utilization of Niagara," T. C. Martin.

House Drainage and Sanitary Plumbing. By Wm. Paul Gerhard, C. E. Published by D. Van Nostrand Co., New York.

This is a new and the seventh edition of the little book first published by Mr. Gerhard sixteen years ago.

Painting on Metal, With Specifications. By A. H. Sabin, M. S. Published by Edward Smith & Co., New York.

Frequently inquiries come to the editorial department of Municipal Engineering asking for information as to paint which will prevent corrosion, and some discussion of this subject has appeared in the magazine in the past. Mr. Sabin's little book will be appreciated by those looking for information of this kind. It contains specifications prepared by him, with the aid of criticisms from engineers of experience. It contains a number of illustrations of water towers, bridges and other iron structural work.

Notes on Water Supply. By J. T. Rodda, Assoc. M. Inst., C. E. By King, Sell & Ralston, Ltd., London.

The title fairly indicates the character of this work. It is a collection of many fragments of information relating to water works, such, for instance, as might be gathered from the volumes of Municipal Engineering for two or three years. It makes no pretension to being a thorough treatise of any branch of the subject. About one-third of the volume consists of blank ruled paper for such memordum as the reader may wish to add.

Municipal Reports.

Annual Report of the Street Department of the City of Boston for the Year 1897. By Benj. W. Wells, Superintendent of Streets.

The reports of the street department of Boston have for a number of years varied little in form. They have been among the most complete in municipal data issued by any American city, and the latest is simply an extension of the record, with the added value of covering one of the most active years in the history of the city. Many new streets were constructed and many old ones reconstructed, including the completion of the boulevard system commenced in 1895. There is, however, still much work to be done, and a large appropriation for this purpose is urged. The attention given parks and boulevards has been at the expense of streets. "It is capable of demonstration," the superintendent says, "that the amount of loss to the teaming interests annually caused by the rough and uneven pavements, to say nothing of the unsightliness and discomfort to the great mass of citizens, reduced to dollars would equal an immense sum of money." The superintendent thinks a mistake is made in too widely distributing the expenditure on street improvement, and advocates the passage by the legislature of an act allowing the city to reconstruct down town streets by an appropriation made outside the debt limit. This, it is believed, will be better than the present plan of appropriating $25,000 annually for each of twenty-five wards. The more extensive use of asphalt is advocated on streets now paved with macadam on granite block.

Much was acomplished during the year in improvement of the sewer system. The expenditure on this work amounted to over $1,100,000. A new law gives the city the power to borrow $1,000,000 annually for sewerage construction, the work to be assessed on all estates benefited. The act also provides

that a rental charge for the use of sewers shall be made equal to the amount required for their maintenance and care. The expenditures on this work will be very large for a few years, until the system is fully developed, and will then diminish from year to year.

The sanitary department during the year disposed of 353,725 loads of fifty-four cubic feet each of house dirt and ashes, and 56,783 loads of house offal. The cost of this service was $492,670. The department finds the steel carts used in this work much more satisfactory than the old form of wooden cart.

The street cleaning service covered 13,261 miles of streets, at a cost of $309,993, including the removal of 121,768 loads of dirt. Street watering cost about $155,000.

The report of City Engineer Jackson shows that the average cost of asphalt patching during the year was .107 per square yard of surface. The average cost of asphalt paving, under a guarantee of five years, is about $3 per square yard, with binder course and concrete base.

Twenty-second Annual Report of the Executive Board of the City of Rochester, N. Y.

The data of the water works department in this report is in good form and quite complete. The report of Mr. E. Kuichling, the chief engineer, discusses all questions of importance arising in connection with his department, though most of these are entirely local in character or have been heretofore noticed in the news departments of this magazine. The policy of placing water meters on all large service pipes was continued during the year, with marked beneficial results, not only in the moderate rate of consumption, but also in the comparative uniformity of such rate in the various seasons. The extreme variations in consumption were 7.4 per cent. above and 5.4 per cent. below the average. In cities where meters are not extensively used such percentages are much greater.

The report of E. A. Fisher, city engineer, briefly reviews the work of his department, in which there are 22 men employed, seven of whom are assistant engineers and the others are draftsmen, rodmen, transitmen and chainmen. The work embraced 4.44 miles of pavement, costing $303,018; 4.85 miles of sidewalk, $9,895; 5.43 miles of sewers, $72,675, and miscellaneous improvements, $24,495.

Annual Report of the Board of Street and Water Commissioners of the City of Newark, N. J., for the Year 1897.

Mr. J. Crowell Mundy, the general superintendent of works, reports data showing the average cost of sweeping block pavements by machinery to be $27.80 per mile and by hand, $68.29; cobble, by hand, $105.66; asphalt and brick, by hand, $3.42. The total cost of cleaning block pavements was: For 292 miles, by machinery, $8,206, and for 107 miles, by hand, $7,369; cobble pavements, 31 miles, by hand, $3,326; cleaning brick and asphalt, by hand, 4,300 miles, $14,716. M. R. Sherrerd, engineer and superintendent of the water department, shows, by his records, an average daily consumption of 25,000,000 gallons of water, or 789 gallons daily per tap. As the yearly increase is about 2,000,000 gallons per day Mr. Sherrerd calculates that the city will reach the full capacity of its new plant in 1910. Mr. Ernest Adam, engineer of streets and sewers, reports that in brick paving allowance is made for expansion by filling the joints in one foot of every fifty feet and along the curbstone with paving mastic instead of Portland cement grout. This has been successful in avoiding the rumbling noise produced when hydraulic cement grout is used for filling the joints.

MACHINERY AND TRADE.

Durable Painting Materials.

Considerable has been written lately about an old sign in possession of the Western Society of Engineers at Chicago. The words "Harper's Ferry," painted in black, stand out as boldly as when they were first formed by the artist's brush, while the wood around the letters, which was painted with white paint, has worn away about one-sixteenth of an inch. It is asserted by the writers that no paint manufactured nowadays is equal in durability to that which was applied on the old sign.

Mr. William Hooper of Ticonderoga, N. Y., does not see anything specially remarkable in the preservation of the old sign and claims that there is just as good a paint made nowadays as then. He adds: "I have seen signs that have been painted with black paint directly on the clapboard of the building. The lettering was good after the paint on the balance of the building had disappeared, and after this the whole building was painted over, lettering and all, and the lettering obliterated; yet within ten years afterward the old black lettering appeared again quite freshly to view. I suppose the paint for the lettering was made of linseed oil and lamp black. I believe, however, that finely ground graphite mixed with pure linseed oil, will last as long, or longer, than any other paint ever known of or used. I had a large iron casting which laid in my mill yard for over thirty years. It was

painted with only one coat. The old casting was broken up and sold for old iron last month, and I noticed that the paint on the pieces of casting, even after being broken up, looked quite fresh.

"If the surface to be painted is perfectly dry when the finely ground graphite is applied, the paint will prove the most lasting paint known, because if time eliminates all of the oil, the graphite seems to adhere to the surface painted just the same as a piece of paper or wood will appear after it has been rubbed with a lead pencil or a piece of graphite. No other pigment known to me will remain on the surface painted after the oil has been thoroughly destroyed. With the experience I have had with graphite paint, I thoroughly believe that if any dry surface be covered with graphite paint and left untouched for a period of thirty years—by which time the oil will have disappeared—no doubt a letter could be written plainly on the surface by using a piece of large wire or nail after smoothing the end of the wire or nail which is to be used as a pencil. I have done all this and shown it up to others. Writing with the piece of wire polishes the graphite which adheres to the surface, showing that it is there still."

A New Asphalt Company.

The Uvalde Asphalt company, incorporated under the laws of West Virginia, has lately been formed, the object of the company being the purchase and operation of the asphalt mine formerly owned by the Litho-Carbon Rubber company. Extensive improvements have been made to the plant which will enable the company to sell their refined material at a price considerably reduced from that at which it has been heretofore sold. By the 1st of January, 1899, the works will be in full blast. The property, which is situated at Cline, Uvalde county, Texas, comprises a bituminous limestone deposit of which there is said to be an inexhaustible supply, and a plant of the most approved pattern capable of producing 6,000 tons of pure bitumen annually. The mines, which are about six miles south of the main line of the Southern Pacific main line, are connected with the same by a spur track, owned by the Uvalde Asphalt company, of standard gauge and construction. The directors of the company are Messrs. Edward J. Berwind of the Berwind-White Coal Mining company, H. L. Camman of Messrs. H. W. T. Mali & Company, Mitchell Clark of Messrs. Naylor & Company, Abraham Vansicien of Jamaica, Long Island, and R. T. Rokeby, all well known and influential men. The present offices of the company are at No. 1 Broadway, New York City, where the vice-president, Mr. R. T. Rokeby, is in charge.

How Two-Cent Fare Will Affect Business.

A railroad official makes the following statement regarding the anticipated effect of two-cent fare legislation: "Notwithstanding the continual increase in expenditures for improvements demanded by this progressive age, there has not been a perceptible increase in the net revenue collcted by railways. On the other hand it has required careful financiering and shrewd business tact to carry on the business successfully, particularly in recent years when depression in trade has affected business circles generally. It will be lamentable, indeed, if the legislature enacts a law compelling railways to make passenger fares two cents per mile and thereby strangle an industry which gives employment to thousands of citizens and which annually pays into public funds an enormous amount of money. A two-cent fare law can not result otherwise. If railway profits are now at a low ebb, a compulsory reduction in revenue will sink them still deeper. Less revenue will necessitate the curtailing of expenses which will naturally affect the list of employes, number of trains and standard of service. Improvements will not go on, and the salary list will be shortened. Nearly every railway city, town and hamlet in the country has one or more railway employes in its population, and one or more families dependent upon the pay car of some railway. Less revenue for the railway means the disbursement of less money through employes. The effect will be felt on all sides, decreased salaries and idle men will lessen the demand for various articles and an era of business stagnation will result."

Trade Notes.

Sewer pipe works have been opened up at Eldora, Ia., by D. Giilis McGregor.

A cement factory will be built at Cass City, Mich., according to press reports.

Additional kilns are being built for the Portland Cement works at Portway, N. Y.

The works of the Bonneville Cement company, Siegfried, Pa., are being extensively enlarged.

The Bronson Portland Cement company, Bronson, Mich., contemplates increasing its capacity.

The purchase of a street sweeper and road machine has been recommended at South Omaha, Neb.

The capacity of Locher & Co., cement manufacturers at Balcony Falls, Va., will be increased.

The Capital City Vitrified Brick company, Topeka, Kas., received the bronze medal at the Omaha exposition.

M. W. Blunt, jr., of Washington, D. C., has purchased the Potomac cement works near Shepardstown, Md.

The mills of the Western Portland Cement company, Yankton, S. D., have been closed for the annual repairs.

The Illinois Granite, Brick and Cedar Block Pavers' Union, Chicago, Ill., has been incorporated, for mutual benefit.

Control in the Bell Sewer Pfpe Works, at Vincennes, Ind., has been purchased by Theodore Ahern of Louisville, Ky.

The Pittsburg Vitrified Paving Brick company, Kansas City, Mo., was awarded the silver medal at the Omaha exposition.

The Lower Brick company, Sioux Falls, Ia., has purchased new machinery, will improve its plant and manufacture paving brick.

The Clinton Cement company, Pittsburg, Pa., contemplates the manufacture of Portland cement from furnace slag under a new process.

The Glens Falls Portland Cement company, Glens Falls, N. Y., is erecting two new kilns and a fire-proof storehouse for cement storage.

The Galesburg Paving Brick company suffered a loss of $3,000 recently through the burning of a large building over the continuous kiln.

The plant of the Huntington Paving, Building and Brick company, Huntington, W. Va., has been purchased by J. Hoische and others.

Samuel J. Immel, Canton, O., has sued the Diamond Portland Cement company to recover damages for personal injuries amounting to $20,000.

James Porter has purchased the plant of the American Fire Clay company at New Cumberland, W. Va., for $12,910, and will put it in working order.

The Michigan Alkali company, Wyandotte, Mich., will erect a large plant for the manufacture of Portland cement from the refuse of the works.

City Engineer Briggs of Erie, Pa., has recommended that $3,000 of next year's appropriation be set aside for the purchase of a 10 or 12-ton street roller.

The output of the Atlas Cement company, Northampton, Pa., is being steadily increased and will be until it reaches a capacity of 10,000 barrels per day.

The White Farm, Quincy, Mich., was transferred, Dec. 2, to the Michigan Portland Cement company, who will build a plant at once. The White Farm contains 100 acres.

The erection of Portland cement works is contemplated by parties from Jackson, Mich., who have secured options on 500 acres of marl land three miles south of Brooklyn, Mich.

Montague, Graves & Benham, Cass City, Mich., have secured leases and options upon 1,000 acres of land preparatory to establishing a plant for the manufacture of cement and fertilizer.

The Portland Cement Works, located at Marlbank, Manitoba, are to be reopened after five years of suspended operations. The village of Marlbank is situated on the Bay of Quinte railway.

The management of the Renovo Fire Brick Works, Renovo, Pa., has been accepted by George W. Brenham, who was formerly connected with the Savage Fire Brick company, Keystone Junction, Pa.

The Gem City Paving Brick company, Quincy, Ill., has filed articles of incorporation. The stockholders are John J. Shea, John C. Shea, Susannah C. Shea, E. K. Stone, jr., W. S. Warfield and C. H. Castle.

The establishment of a cement factory on the outskirts of Owosso, Mich., is contemplated by Geo. T. Abrey, who is negotiating with Ohio parties for the purchase of the land. Employment will be given to 1,000 men.

The erection of a $150,000 cement plant next spring at Homer, Mich., by Mr. Bunce of Bronson is contemplated provided the citizens of this town will give the company he represents a little assistance in some way.

The New York Filter Manufacturing company, New York City, has brought suit, through its patent solicitors, in the United States circuit court against Powell Jackson, trading as the Jackson Filter company, St. Louis, Mo., to restrain him from manufacturing or selling the Jackson filter, which, it is claimed, infringes patent No. 293,740, owned by the plaintiff.

The New Castle Asphalt Block company, New Castle, Pa., is considering the establishment of an asphalt block plant at Toledo, O., which will be a separate institution altogether from the works at New Castle.

A Michigan syndicate proposes, according to press reports, to invest nearly a million dollars in a cement factory at South Bend, Ind., where it is expected to secure a fine grade of marl from Chain Lakes, five miles from that city.

The California Portland Cement company, Los Angeles, Cal., has filed articles of incorporation. The directors are: John P. Culver and Frank H. Jackson, Los Angeles; Ernest Waycott, Harry O'Brien and Richard H. Waycott of San Bernardino.

The Sand Filter and Construction company, 35 N. Second-st., Camden, N. J., has been incorporated to construct all kinds of filters. The incorporators are J. S. White, Merchantville, N. J.; Augustine T. Lynch, Philadelphia; John O. White, Camden.

The Baltimore Filter company, Baltimore, Md., has been incorporated to build filters for filtering water and all kinds of oil. Robert M. Spedden, Robert H. Smith, Jos. E. Henderson, Lucien B. Carpenter and Z. Franklin Potter are the incorporators.

Hetherington & Berner, Indianapolis, Ind., have completed for the Western Paving and Supply company the largest railway asphalt plant ever built. The plant was built for use in asphalt paving contracts which the Western Paving and Supply company has in Evansville, Ind.

The Pridham Fertilizer and Chemical Commercial company, 781 Broad-st., Newark, N. J., has been incorporated to manufacture fertilizers, collect, sterilize and dispose of sewerage, water and other liquids, by Paul Buchanan, Marshall and Samuel S. Pridham and L. D. Gilmour of Newark.

The Healy Construction company, 60 Grand-st., Jersey City, N. J., has been incorporated to construct, equip and improve public or private water works. The incorporators are Wm. M. Laws, Jersey City; Austin S. Healy, 64 Fifth-ave., New York City; Daniel W. Beach, Washington, D. C.

The deal between Cleveland and German capitalists, to establish a cement plant at Milford, Ind., is said to have been abandoned. Cleveland capitalists own a tract of land near Milford on which are located valuable marl lands. An effort will now be made to interest an English syndicate in the lands.

Chicago capitalists have purchased the bed of an old lake seven miles east of LaGrange, Ind., and will erect a cement plant and build a model town around it. Grove E. Norton, 148 Dearborn-ave., Chicago, purchased the land. Another large piece of land has been purchased near LaGrange by Bovie, Treat & Bunce, Michigan capitalists, who contemplate building cement works.

A sales agency combine in sewer pipe has been proposed by Col. W. B. Eastland of Toronto, O., which shall have the handling of the product of all factories, including the fixing of prices. It is claimed by manufacturers that sharp competition has reduced prices to a ruinously low figure. The plan of L. F. Lapscott of New York, to form a sewer pipe trust, failed, and this plan is proposed in its place.

The United States circuit court of the district of New Jersey has granted an injunction against the Whitaker Cement company as a user of the Griffin mill, which is declared to be an infringement upon the mill patented by F. A. Huntington May 8, 1883. Fraser & Chalmers, 159 Fulton-st., Chicago, Ill., are makers of the Huntington mills.

The Manhattan Concrete company of New York City is reported as having made an assignment to Henry L. Fridenberg, with liabilities of $60,000 and actual assets of about the same amount. Liens filed on the company's contracts in favor of the Standard Silica Cement company of New York City is said to have precipitated the assignment.

Mr. C. W. Turner, superintendent of the Scioto Fire Brick company, states that there has been a good demand for their product, especially for their paving block, 3½x5x9¼ in size. They have made large sales of this block in St. Louis. They also make a block 3x4x9, for which there has been a large sale. "Our works," says Mr. Turner, "have been running to their full capacity since starting up in the spring, yet we have been unable to fill our orders, so great has been the demand."

The lease of the Raven company (St. Louis and Chicago) for 250,000 acres of asphalt and gilsonite lands in southern Utah, was signed by Secretary Bliss of the interior Dec. 2. The Chicago contingent is given practical control of the gilsonite and elaterite deposits and the St. Louis and West Virginia contingent secures the asphalt deposits.

The Michigan Portland Cement company, Detroit, Mich., has filed a mortgage for $1,000,000 in favor of the Central Trust company of New York. The mortgage is filed for the purpose of facilitating the issue of bonds and covers all lands and goods of the company. The company operates one of the largest cement factories in the world at Coldwater, Mich.

A new catalogue and price list, containing several hundred illustrations, has been issued by the Jeffrey Manufacturing company of Columbus, O. Several new lines have been added to the specialties made by this company, including spiral conveyors, elevated buckets, the Jeffrey-Columbian separator, bolter and screen and the Jeffrey century belt conveyor system. Copies will be sent free on application to the company.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Pontiac, Ill.—The paving case, in which the Talbot Paving company was awarded $15,000 recently, will be carried to a higher court.

Washington, D. C.—Several plans for street extension were presented to the Highway Commission, Dec. 14, by the district commissioners.

Pittsburg, Pa.—The Pennsylvania R. R. company is having vitrified brick platforms and sidewalks laid at some of the stations along the E. & A. division.

St. Paul, Minn.—Advance sheets of the annual report of City Engineer Rundlett show that 1½ mis. of asphalt pavement have been laid during the last year, at a cost of $82,657; 600 ft. of brick pavement, $3,360; total, $86,017.

Syracuse, N. Y.—Mayor McGuire has instructed the corporation counsel to prepare a bill for introduction in the legislature, authorizing the city of Syracuse to manufacture its own concrete, curbing and foundation material for street paving purposes by the day labor system.

Chicago, Ill.—It is claimed that the Chicago street repair contract, which is held by John H. McCarthy, was awarded in violation of the law. The law provides that all city contracts involving an outlay of more than $500 shall be awarded only on public bids. This contract, amounting to nearly $400,000, was given to Contractor McCarthy without inviting bids and without the formality of competition.

Bloomington, Ill.—The supreme court has affirmed the decision of the lower court in the case of the city of Bloomington vs. Reeves. The city passed an ordinance for paving portions of W. Chestnut and N. West-sts., as a single improvement, having secured the majority of the frontage. A majority of the property owners on Chestnut-st. were objectors, maintaining that each street constituted an improvement of this kind in itself. The court sustained this contention.

East St. Louis, Ill.—Judge Rhodes, of the county court, upheld the legality of the ordinances for paving five streets with brick. The ordinances were passed in 1895 and 1897. Bids have been received and the contracts will probably be let in a short time, now that this decision has been rendered. When the municipal authorities served notice on the property owners of the proposed work, a number of them objected, but they withdrew their objections a short time before the time set for them to be heard before the county court.

Galesburg, Ill.—(Special.)—M. J. Blanding, cy. engr., says contracts have been completed this fall as follows: Single course brick paving—By J. B. McAuley, contractor, Sumner-st., 1,270½ lin. ft., $5,140.70; N. Academy-st., 1,364½ ft., $5,571.93; Cherry-st., 1,260½ ft., $5,979.95. By Welch, Patterson & Striffler, N. Cedar-st., 5,280 ft., and W. North-st., 328 ft., $24,019.66. Bridges—J. B. McAuley, contractor: Over Cedar Fork creek, N. Seminary-st., $1,971.70. Sewers—Jas. O'Connor, contractor: Pine-st., 1,181 lin. ft. 12 in., $966.70; J. B. McAuley, contractor, Ella-st., 382 ft. 12 in., $268.38. Jas. O'Connor has the contract for sewers in N. Pearl and Losey-sts. and Beecher-ave., but these are uncompleted.

CONTEMPLATED WORK.

Portsmouth, O.—Paving is contemplated for Gallia-st.

Waterford, N. Y.—Brick paving is contemplated for Broad-st.

Portland, Ore.—Wooden block paving is contemplated for Alder-st.

Urbana, Ill.—The question of paving Mathews-ave. is being agitated.

San Francisco, Cal.—Bitumen paving is proposed for Valencia-st.

Bradford, Pa.—Brick paving is contemplated for Main-st. next year.

Toledo, O.—The property-owners have petitioned for the paving of Orange-st.

Rome, N. Y.—Smooth street paving is contemplated, according to press reports.

Wethersfield, Conn.—This town has voted to macadamize a portion of Newington-ave.

Oskaloosa, Ia.—A resolution has been passed to pave D-st. with brick.

Chester, Pa.—An ordinance has been passed for paving Edgmont-ave. with brick.

Norfolk, Va.—Resolutions have been passed for paving Fenchurch and Chapel-sts.

Bryan, Tex.—The grading and graveling of Main and intersecting streets is contemplated.

Hamilton, O.—A resolution has been passed to pave E. Dayton-st. M. O. Burns, cy. clk.

La Salle, Ill.—Petitions are being circulated asking for brick paving on several streets.

Macon, Ga.—Fifth-st., from Fourth to Ocmulgee, will be paved with granite cubes. Mayor Price.

Midvale, N. J.—A petition to improve four miles of the Greenwood Lake road next spring has been favorably passed on by the state road commissioner.

Norfolk, N. Y.—A resolution has been adopted to improve two and one-half miles of highway. Co. Comr. Mein.

Canton, Ill.—The board of local improvements has granted a petition for paving North-ave.

Quincy, Ill.—The board of local improvement determined, Dec. 19, upon fifty-four blocks of paving for next year.

Fulton, N. Y.—Plans and specifications are being prepared by the village engineer for paving Second-st.

Toledo, O.—Plans are being prepared by the Park board for a boulevard 12 mls. long and 200 ft. wide.

Davenport, Ia.—The paving committee decided, Dec. 20, on 59 blocks, or 4 mls., of street paving during the next year.

Santa Rosa, Cal.—Bitumen paving is contemplated for Mendocino-st., from Fourth-st. to the city limits.

Cleveland, O.—Resolutions were passed Dec. 5 to improve portions of nine streets. Howard H. Burgess, cy. clk.

Oakland, Cal.—Resolutions have been passed for macadamizing portions of Filbert, Jackson and other streets.

Annapolis, Md.—The city commission has been instructed to enforce the ordinance requiring sidewalks to be paved.

Anderson, Ind.—Street paving ordinances will be introduced into the council in January, according to press reports.

Spokane, Wash.—The council has authorized the preparation of plans for asphalt paving on First, Monroe and Bridge-aves.

Newark, N. J.—The ordinance for paving Warren-st., from Newark to Bruce, with oblong granite blocks has passed to third reading.

Seattle, Wash.—A hearing will be given Jan. 2 on the proposed improvement of certain streets. W. V. Rinehart, prest. coun.

Eau Claire, Wis.—The city council has decided upon plans for paving certain streets with vitrified brick next spring.

Rockford, Ill.—Petitions have been referred to the board of local improvements for macadamizing Kent and Morgan-sts.

Woodbury, Pa.—Plans and specifications have been approved for a macadam street through this town by State Commissioner Budd.

Amsterdam, N. Y.—A bill will be offered this winter authorizing the construction of a macadam road from this city to Northville.

Jamestown, N. Y.—Bids will be asked soon for paving Chandler-st., between E. Second and Windsor, with brick or concrete.

New Orleans, La.—Bids will probably be asked soon for 34 blocks of asphalt or brick paving in Algiers. Albert Tufts, cy. clk.

Mankato, Minn.—North Mankato has voted to incorporate as a village and now contemplates making street and other improvements.

Indianapolis, Ind.—A petition was presented to the board of public works Dec. 12 for a wooden block roadway in Ash-st., from Sixteenth to Twenty-first.

Pekin, Ill.—A resolution was adopted by the board of public improvements Dec. 19 to pave Elizabeth, Fourth and Capital-sts. with brick.

Council Bluffs, Ia.—Action on the bids for paving Fourth-st. and Fifth-ave. with asphalt has been laid over until the regular meeting in January.

Quincy, Ill.—Mayor Steinbach proposes that a few blocks of single course brick paving on a 5-in. sand foundation be laid as an experiment.

Bryan, Tex.—An estimate has been submitted to the city council for curbing, guttering, grading and graveling the principal business streets.

Des Moines, Ia.—The property-owners on Twenty-first-st., from Cottage Grove-ave. to University, have petitioned the council for asphalt instead of brick paving.

Spokane, Wash.—Plans and specifications for paving the business streets with asphalt have been submitted and definite action will be taken in the spring.

New Rochelle, N. Y.—A proposition has been made to the village trustees to rebuild the entire street system of this city and keep it in repair for five years. Prest. Clark.

Philadelphia, Pa.—The councils committee on highways has agreed to recommend a bill to put down asphalt strips on Broad-st., between Huntington-st. and Lehigh-ave.

Detroit, Mich.—Asphalt repaving has been recommended, during 1899, for portions of John R., Garfield, Brush and Watson-sts. and Cass, Bagley and Canfield-aves. and Farmer-st.

St. Paul, Minn.—City Engineer Rundlett has submitted to the board of public works a plan for macadamizing Como-ave., from Dale to Rice-sts.; estimated cost, $42,715.

Des Moines, Ia.—The paving committee has recommended brick paving on concrete, with Murphy grout filler, for portions of Eighteenth, Linden, Cherry, Eleventh, Center and Park-sts.

Baltimore, Md.—An ordinance has been passed to pave Baltimore-st., from Grove-alley to Chester-st., with asphalt, and Light-st., from Pratt to Lee, with Belgian blks.

Cairo, Ill.—(Special.)—William H. Mourey, cy. clk., says there is talk of the property owners on Levee-st. paving with brick. The city is to pass an ordinance authorizing the

work to be done, and instead of assessing the property the property owners will pay for the work. Nothing has been done yet except circulating the petition.

Baltimore, Md.—Ordinances have been introduced recommending appropriations for sheet asphalt paving on Wolfe, Jefferson and Monument-sts., and vitrified brick paving on Gough-st., from Bond to Broadway.

Sioux City, Ia.—Brick paving has been decided upon for Jones, Jennings, Virginia and Court-sts., and brick and asphalt are being considered for certain streets. Bids will probably be asked about March 1.

Alliance, O.—(Special.)—This city contemplates paving Union-ave. with asphalt blocks and S. Webb and S. Freedom-aves. with shale paving brick. Joe McConnell, cy. clk.; O. W. Pfouts, Cy. C. E.

Chicago, Ill.—The board of local improvements passed ordinances Dec. 7 to pave Halsted-st., from Lake-st. to Chicago-ave., with brick, and Chestnut-st., from N. State to Lincoln park boulevard, with asphalt.

Lebanon, Pa.—The question of street paving is being agitated. The streets are paved with limestone and cinder macadam, with the exception of about half a block of asphalt block paving. George W. Hays, cy. engr.

Galesburg, Ill.—(Special.)—M. J. Blanding, city engineer, says an ordinance has been passed by the city council for the improvement of Chambers-st., from Main to South, 1,100 lin. ft., with double course brick pavement.

New Orleans, La.—An ordinance has been introduced providing for paving the lower side of Esplanade-st., from White to Dupre, with asphalt. An ordinance is also before the council to pave Claiborne-ave., Prieur and Camp-sts.

St. Paul, Minn.—Final orders have been passed for paving Cedar-st., from Second to Como-ave., with asphalt, and from Summit to Como with brick or sandstone. Sherburne-ave. will be macadamized and have 3-ft. brick gutters.

Brooklyn, N. Y.—A petition has been presented to the local board of the Eighth district asking for the extension of Bedford-ave., from Eastern Parkway to Flatbush-ave., a distance of about 2 miles, and for paving the extension with asphalt.

Peoria, Ill.—The city council passed ordinances, Dec. 20, for paving Elizabeth-st., from Moss-ave. to Main-st., and from Windom-ave. to Main with brick. The board of local improvements will give a hearing Jan. 9 on the proposed paving of Seventh-ave., from Union to Western. Paving is contemplated for St. James-st.

CONTRACTS TO BE LET.

Cincinnati, O.—Bids are asked until Jan. 7 for macadamizing Montgomery pike. J. A. Stewart, 518 Johnston Bldg.

Morton, Minn.—Bids will be received until Jan. 3 for 240 ft. of flagging stone for street cross walks.

Yonkers, N. Y.—Bids will be received until Feb. 27 for regulating and grading Riverdale-ave., from Culver-st. to the city line.

Valparaiso, Ind.—Bids are asked until Jan. 7 for constructing the Valparaiso-Chesterton gravel road. Jas. S. Fulton, co. comr.

Houston, Tex.—Sealed proposals will be received until Jan. 9 for repaving Main-st., between Franklin and McKinney-aves., as follows: Excavation, 8,500 cu. yds.; paving, 19,000 sq. yds.; stone curbing, 4,500 lin. ft. S. H. Brashear, mayor; I. A. Miller, cy. engr.

St. Paul, Minn.—Bids will be received until Jan. 12 for furnishing and delivering American Portland cement. Frederick V. Abbott, major engrs.

Decatur, Ind.—Bids will be received until Jan. 5 for constructing about 17½ mls. of macadam roads in Washington township. W. E. Fulk, co. surv.

Indianapolis, Ind.—Bids will be received until Jan. 4 for paving an alley with brick; curbing with stone a part of Park-ave.; graveling an alley. M. A. Downing, chrmn. B. P. W.

Duluth, Minn.—Sealed proposals will be received until Jan. 10 for furnishing 12,000 bbls. of Portland cement for the concrete superstructure for piers for the Duluth ship canal. Clinton B. Sears, major engrs.

Cincinnati, O.—Sealed proposals will be received until Jan. 17 for macadamizing Hopson-st., from Molitor to St. Clair, and setting curbs and crossings, flagging and paving gutters, etc. Geo. H. Spellmire, clk. bd. cy. affairs.

CONTRACTS AWARDED.

Belleville, Ill.—Hill & McCabe secured the contract Dec. 12 for paving St. Clair-ave.

Wausau, Wis.—The contract for macadamizing Franklin-st. has been awarded to Anton Eichert for $5,545.

Council Bluffs, Ia.—Contracts have been let during 1898 for 30,000 square yards of brick paving at $1.27½ a square yard.

Braintree, Mass.—Charles McDermott & Son of Brockton have been awarded a paving contract for $5,440.

Newark, N. J.—The contract for regulating, grading and curbing Orange park has been awarded to Ludwig Batt of South Orange for $22,524.50.

Scranton, Pa.—The contract for repairing all asphalt streets for the next ten years has been awarded to the Barber Asphalt Paving company at $17,520 per year.

Jersey City, N. J.—The New Jersey Mexican Asphalt company submitted the lowest bid for paving Prospect-st. with asphalt at $1.74 a square yard.

Crown Point, Ind.—The contract for building twenty miles of macadam roads has been awarded to the Brownell Improvement company of Chicago for $124,500.

Chicago, Ill.—The Bermudez Asphalt Paving company was awarded the contract Dec. 5 for curbing and paving with asphalt Vernon-ave., from Fortieth-st. to the Union stock yards and transit railroad.

St. Augustine, Fla.—The contract for paving St. George-st., from King to St. Frances-st., was awarded Dec. 7 to McGuire & McDonald for $8,933 and $160 for catch basins and pipe for drainage.

Hoboken, N. J.—Paving contracts have been awarded, according to press reports, as follows: Utica Asphalt Paving company, Utica, N. Y., two streets, $13,008; N. J. Mexican Asphalt company, three streets, $10,262.

Macon, Ga.—Paving contracts have been awarded as follows: Brick paving 15,000 square yards, E. M. Lasley, $2.08 a square yard; granite pavement, 10,000 square yards, Georgia Quincy Granite company, $2.53 a square yard.

Council Bluffs, Ia.—The contract for paving Harrison-st., Washington-ave. and Tenth-ave., between Main and Sixth-sts., was awarded Dec. 1 to E. A. Wickham at $1.27½ a sq. yd., using Council Bluff brick for top and bottom courses.

Philadelphia, Pa.—Paving contracts for 1899 have been awarded as follows: Resurfacing streets with sheet asphalt, 10 years' guarantee, Vulcan Paving company, $2.40 a sq. yd.; repaving and maintaining county roads, Daniel McMahon, $94,800.

Omaha, Neb.—Paving contracts were awarded Dec. 2 as follows: Class B asphalt, 1½ in. surface, 1½ in. asphalt binder, 4 in. concrete, 5 years' guarantee, Hugh Murphy, $1.59 a sq. yd.; vitrified brick, 6 in. concrete, 5 years' guarantee, A. C. Powers, 67 cts. a sq. yd.

Dallas, Tex.—The Franklin Fire-Proofing company, of this city, secured the contract for 11,400 sq. yds. of 2 in. rock asphalt pavement on 6 in. concrete, at $1.97, 10 years' guarantee. A schedule of all the bids received for this work was given in the December issue of Municipal Engineering Magazine.

New Orleans, La.—Bids for asphalt paving on Bertin and First-sts. were received as follows: Barber Asphalt Paving company, New York City, $2.07 and $1.89, respectively; Ayres Asphalt Paving company, $2.05 and $1.90; Belden & Seeley, $2.09 and $2.12; Southwestern Alcatraz company, $2.24 and $2.28.

Dayton, O.—Bids were received Dec. 12 for paving three streets as follows: Warren-Scharf Asphalt Paving company, New York City, $2.05 for each street; Trinidad Asphalt Paving company, Cincinnati, $2.10, $2.05 and $2. M. G. Cain, Dayton, brick, $1.44; asphalt, $2.44. E. Brentlinger, brick, $1.50 for each street.

Buffalo, N. Y.—The contract for surfacing Ferry-st., between Niagara-st. and Massachusetts-ave., was awarded Dec. 8 to the Barber Asphalt Paving company for $14,533. The lowest bids received Dec. 13 for paving Parkview-ave., from Winchester-ave. to Duerstein-st., were as follows: Brick, John Mumm, $3,649; asphalt, Barber Asphalt Paving company, $4,447.

Hamilton, O.—Bids were received Dec. 19 for paving Second-st. as follows: David Folz Asphalt Paving company, Cincinnati—Asphalt, $1.67 a sq. yd.; block asphalt, $1.98. J. M. Quill, Cincinnati—Asphalt block, $2.05; brick, $1.29. Aug. Henkel, Cincinnati—Asphalt block, $2.12; brick, $1.23. Townsend Brick company, Zanesville, O.—Brick, $1.26. Irwin Bros., Hamilton—Asphalt block, $2.05; brick, $1.32. Warren-Scharf Asphalt company, Cincinnati—Asphalt, $1.73.

Louisville, Ky.—Bids were received Dec. 2 for paving several streets with asphalt. The bids were based on two kinds of pavement, both with a 6 in. concrete foundation and differing only in the wearing surface and binder, pavement No. 1 having 1½ in. binder and 2 in. wearing surface, and No. 2 a 1 in. binder and 1½ in. wearing surface. The bids, which were for 5 and 10 years' guarantee, were as follows: Assyrian Asphalt company, Chicago, Ill., No. 1, $18.90 and $28.90; No. 2, $18 and $28. Barber Asphalt Paving company, New York City, No. 1, $19.50 and $24.30; No. 2, $17.50 and $22.30. Alcatraz Asphalt company, San Francisco, Cal., No. 1, $19.40 and $23.40; No. 2, $17.40 and $21.40. Bids were received from L. R. Figg and the Boston Paving company, but were rejected as informal.

SEWERS.

CONTEMPLATED WORK.

Tuckahoe, N. Y.—The construction of sewers is contemplated.

Riverton, N. J.—The city has voted to construct sewers.

Allegheny, Pa.—Bids have been authorized for a main sewer.

Chester, Pa.—Ordinances for sewers in three streets have been passed.

Dunmore, Pa.—The question of building sewers will be voted on in the spring.

Rochester, N. Y.—A sewer is contemplated for N. St. Paul-st. Peter Sheridan, cy. clk.

Lebanon, Ind.—The question of building a sewerage system is being agitated.

Carlisle, Pa.—Plans are being prepared for a sewerage system. A. Z. Wetzel, boro secy.

Little Falls, N. Y.—Plans are being prepared for South Side sewers by Engineer Babcock.

Montgomery, Ala.—A bill has passed the house authorizing the city council to issue sewer bonds.

Delaware, O.—The construction of a storm water drain, at a cost of $5,000, has been authorized.

Alliance, O.—(Special.)—O. W. Pfouts, Cy. C. E., is resigning a system of sewers for the Sixth ward.

Elgin, Ill.—The sewer committee has reported favorably on sewer plans; estimated cost, $70,000.

Livingston, Mont.—An ordinance has been passed for a sewer in district No. 2; estimated cost, $4,000.

Bryan, Tex.—A proposition for putting in a sewerage system has been referred to a committee for investigation.

Greensboro, Ala.—About a mile of sewers is contemplated and bids are desired for the complete job. F. B. Randolph, mayor.

Guthrie, Okla.—The council will engage an engineer to prepare plans for a sewerage system. Councilman Saunders.

Independence, Mo.—H. H. Pendleton, C. E., can be addressed regarding the proposed sewerage system. S. A. Sullivan, cy. clk.

Newark, N. J.—An ordinance has been passed to build a pipe sewer on Chapel-st., between Bowery-st. and Passaic-ave.

Birmingham, Ala.—An ordinance has been adopted providing for storm sewers; estimated cost, $4,500. A. J. Camp, cy. clk.

Red Wing, Minn.—The city council has authorized the construction of a tunnel sewer on Third-st., between Bush and Plum.

Toledo, O.—Plans and specifications have been prepared for sewers in main sewer district No. 31. Lem P. Harris, cy. clk.

Orange, N. J.—An ordinance will be rescinded at the January meeting of the common council which provides for sewers in 15 streets.

Derby, Conn.—This city has voted to issue $50,000 bonds for extending and constructing a system of sewers. J. W. Larkin, cy. clk.

Milwaukee, Wis.—The board of public works has informed the common council that $235,100 will be needed for sewerage purposes during 1899.

Guthrie, Okla.—An ordinance has been passed authorizing the engagement of an

engineer to prepare plans for a sewerage system.

Bloomington, Ill.—An ordinance has been passed for a 36-in. and 33-in. brick sewer in the Sugar Creek valley. R. N. Evans, cy. clk.; C. F. Koch, mayor.

Chambersburg, Pa.—Petitions have been presented to the council to have surveys for a sewerage system made. Councilmen Hoffeditz and Kennedy.

Ft. Wayne, Ind.—The employment of an expert to investigate the needs of the pumping station is suggested. F. M Ransdall, cy. engr.

Havana, Ill.—The city attorney has been directed to prepare an ordinance to bond this city for $10,000 or $11,000 for a sewerage system.

New York City.—The Richmond borough board of local improvements has voted to recommend the building of two large systems of sewers for Staten Island.

Louisville, Ky.—Plans have been submitted to the board of public works for a new sewer to drain the western portion of the city; estimated cost, $200,000.

York, Pa.—The finance committee of the city councils decided Dec. 19 to report the $250,000 sewer loan affirmatively and the question will be submitted to vote in February.

East Orange, N. J.—Plans have been adopted for a storm sewer to drain the valley through which the East Orange boulevard runs; estimated cost, $60,000. Essex Co. Park Com'n.

Clinton, Ia.—Chas. P. Chase, cy. engr., has been directed to prepare plans and specifications for a sewer extending from the Ringwood school building to the Ash-st. sewer on Third-st.

Davenport, Ia.—The special committee estimates the cost of constructing the intercepting sewer at $5,500. This does not include the 9-ft. sewer from Marquette-st. to the city limits, which is estimated at $57,850. The estimated cost of extending the present system is $51,370.

Jackson, Miss.—(Special.)—The board of aldermen has ordered an election on Feb. 1 to vote on the issue of $100,000 bonds for constructing a sewerage system. D. P. Porter, jr., cy. clk.; Walter G. Kirkpatrick, cy. engr.

St. Louis, Mo.—Sewer Commissioner Colby has prepared plans for what he believes will be the largest sewer in the world. The sewer will be more than a mile long, and its inside dimensions will be 24x18 ft. The side walls will be 6 ft. and the arch 2½ ft. thick. The base will be 3 ft. thick, and will be constructed of Portland cement and concrete brick. The capacity of the sewer, which will drain seven square miles of territory, will be 4,500 cu. ft. per second.

CONTRACTS TO BE LET.

East Cleveland, O.—Bids are asked until Jan. 14 for sewers. H. B. Chapman, vil. clk.

Elizabeth, N. J.—Bids are asked until Jan. 16 for 800 ft. 12 and 18-in. pipe sewers.

Ponca, Neb.—Bids are asked until Jan. 2 for constructing a drainage ditch. J. F. Ekeroth, co. clk.

Elkhart, Ind.—Bids will be received until Jan. 4 for constructing a sewer in Clark-st. D. F. Cordrey, cy. C. E.

Hamilton, O.—Bids are asked until Jan. 2 for storm sewers on Dayton, Second and Third-sts.; also for sanitary sewers on Second and Third-sts. M. O. Burns, cy. clk.

Mt. Vernon, N. Y.—Bids are asked until Jan. 3 for constructing 12-in. pipe sewers in two streets. W. N. Hoyt, cy. clk.

Kingston, Pa.—(Special.)—Bids are asked until Jan. 2 for the construction of 9,462 ft. of pipe sewers. P. B. Reynolds, prest.

Aiken, S. C.—Bids are asked until Jan. 18 for constructing a system of small pipe sewers with a filtration plant. M. W. Woodward, mayor.

Callao, Peru—Bids will be received until Jan. 15 for sewerage works. Frederico Pergmann, Peruvian Consul-General, 25 Whitehall-st., New York City.

Columbus, Ga.—Bids are asked until Jan. 4 for terra cotta drain pipe, brick, gates or other castings for the year 1899. W. M. Moore, clk. coun.

Cincinnati, O.—Sealed proposals will be received until Jan. 3 for constructing sewers in Bassett road and Purcell-ave. Geo. H. Spellmire, clk. bd. cy. affairs.

CONTRACTS AWARDED.

Toledo, O.—Thomas Kelly secured the contract for building the Paine-ave. sewer for $15,466.

Santa Monica, Cal.—The contract for a lateral sewer was awarded Dec. 5 to Ben Foutz at 58.9 cents.

Bridgeport, Conn.—The B. D. Pierce, jr., company secured the contract for a sewer in North-st. for $1,210.70.

Washington, D. C.—T. B. Jones & Co. secured the contract for the Tiber creek and New Jersey-ave. high level sewer.

Hector, Minn.—The contract for constructing ditch No. 4 was awarded to O. F. Paterson and F. J. Miller for $3,041.

Philadelphia, Pa.—The contract for constructing a sewer in Van Kirk-st. was awarded to David Peoples for $6,934.

Boston, Mass.—The contract for constructing a sewer in Devon-st. has been awarded to J. C. Coleman & Son for $2,673.

Mason City, Ia.—The contract for building a sewer was awarded Dec. 2 to J. H. Killmar of Des Moines, Ia., for $23,900.

Red Bank, N. J.—The contract for constructing sewers was awarded Nov. 29 to P. H. Harrison & Son of New York City for $9,652.30.

Denver, Col.—James F. Mahoney was awarded the contract Dec. 3 for constructing the North Denver sanitary sewer, district No. 3, for $2,641.65.

Little Rock, Ark.—The contract for constructing 8,050 feet of 12, 8 and 6-inch pipe sewers has been awarded to the Arkansas Pump and Pipe company for $4,347.

Newburgh, N. Y.—Bids were received Dec. 19 for building the First-st. main sewer from seventeen companies. The contract has not yet been awarded.

Rochester, N. Y.—Sewer contracts were awarded Dec. 2 as follows: North-st. outlet, brick and pipe, William Fuller, $10,554.65; Pearl and Meigs-sts., Thomas Holahan, $3,790.

St. Louis, Mo.—Sewer contracts were awarded Dec. 6 as follows: Branch-st. dist., No. 35, Robert Wycoff, $866.95; Elliott-ave. dist., No. 46, Patrick McIntyre, $1,043.75.

Wilkinsburg, Pa.—The contract for building 900 ft. of 20-in., 170 ft. 10-in., 192 ft. 8-in. sewers was awarded Dec. 8 to Ott Bros. of Allegheny for $1,434.20.

Riverside, Cal.—The contract for constructing the Twelfth-st. sewer was awarded to J. H. Chambers at 90 cts. per ft.; manholes, $65; Y branches, $2.10; flush tanks, $90.

Alton, Ill.—The contract for constructing a sewer in Park-st. was awarded Nov. 29 to Daniel Ryan at 40 cts. for 12-in., 50 cts. for 15-in. and 70 cts. for 20-in. and $20 each for catch basins and manholes.

Chicago, Ill.—Thomas Burke was awarded the contract Dec. 5 for constructing sewers in N. Fifty-sixth, S. Homan and W. One Hundred and Nineteenth place, and M. J. Healy secured the contract for sewers in Lexington and Butler-sts. and W. Chicago-ave. Contracts for laying drains were awarded to G. W. Barry, Simon Ryan, Philip Quinn and Thomas D. Joy.

Philadelphia, Pa.—Bids were received Dec. 15 for repairing sewers, drain pipes, inlets, inlet necks, manholes and well holes and cleaning sewers during 1899 as follows: Delaplaine & West, first dist., $2,475; second dist., $3,300; third dist., $2,525; fourth dist., $3,450; entire city, $10,248. P. Monaghan, third dist., $2,230; fourth dist., $3,041. B. Monaghan, first dist., $2,490; second dist., $1,349; third dist., $3,300; fourth dist., $3,590. D. Peoples, entire city, $19,000. W. B. Conkling, third dist., $5,970; fourth dist., $6,890.

WATER-WORKS.

Chicago, Ill.—Commissioner of Public Works McGann recommends the purchase of the plant of the Rogers Park Water Works company for the city.

Carlisle, Pa.—The passage of a law for the protection of streams used as a water supply from pollution is recommmended by Health Officer Lee.

White Plains, N. Y.—The Pocantico River Water company has filed a certificate of incorporation with the county clerk. The principal office is in North Tarrytown.

Grand Rapids, Mich.—The water meter question is being agitated and to that end tests have been made which show an enormous waste of city water, estimated at 70 per cent.

Racine, Wis.—An injunction was served on Mayor Graham by a United States Marshal, Dec. 12, restraining the city of Racine and Racine Water company from making a test of the water works plant.

New York City.—A 40 in. main of the Brooklyn water works bursted Dec. 10, causing damages estimated at not less than $800,000. More than 20 blocks in the Twenty-eighth ward were covered by the rush of waters.

Seneca, Mo.—The damage suit brought by the city against the water works contractor, Jas. T. Broughal, has resulted in a complete victory for the city, which will, in a short time, receive its money, amounting, with interest up to date, to more than $7,000.

Middleborough, Mass.—The state board of health has pronounced the pollution of the river by the sewage of this place as one of the possible causes of the large amount of sickness in that portion of the town which is nearest the river. The board recommends that plans be prepared for the establishment of a sewage purification plant.

Brooklyn, N. Y.—It is proposed to increase the water rates in this borough to the level of those in Manhattan, where they are less, and to raise the Manhattan rates to the Brooklyn level where they differ, in order to increase the revenues of the departmnt of water supply and to make possible such extensions to the water supply system as are desired.

Oakland, Md.—The town authorities determined recently to issue $30,000 bonds to provide for the construction of water works, as authorized by the act of 1898, and which provided that the bonds should be issued on or before Jan 1, 1899. G. S. Hamill, town counsel, has pronounced the law defective, for various reasons, but chiefly because there is no provision in it authorizing the passing of ordinances regulating the issuing of bonds.

Mt. Vernon, N. Y.—The common council has entered into a contract, for 10 years, with the New York Suburban Water company. The city is to pay $30 a year for each hydrant, and a hydrant must be rented for every 500 ft. of new pipe laid, making an aggregate rental to be paid by the city of $10,100. The company agrees to furnish meters to its consumers and to establish a meter rate of 22½ cts. for 100 cu. ft. The consumer is to pay the expense for placing the meter in the house.

CONTEMPLATED WORK.

Ute, Ia.—A new water works engine will probably be purchased.

Clayton, N. Y.—Bids will be asked for a water works system. F. J. Hall, vil. prest.

Galesburg, Ill.—The question of a water supply is being considered.

Pittsburg, Pa.—The filtration committee will recommend the use of sand filters.

Bonham, Tex.—Bonds have been authorized for the extension of the water mains.

Middletown, N. Y.—The construction of a filter plant is still under consideration.

Jamesburg, N. J.—Bids will be asked soon for water works. Cy. clk.

Steelton, Pa.—The purchase of a new pumping engine is contemplated by the Steelton Home Water company.

Goshen, Ind.—About 14,161 ft. of 6 and 12-inch pipe will be needed for water main extensions.

Binghamton, N. Y.—Bids will be advertised for 6, 8 and 12-inch pipe required during the next year.

New York City.—The resolution for extending the Queens Water system about 3 miles has been approved.

Minneapolis, Minn.—All bids received for two 10,000,000 gal. pumping engines have been rejected.

San Pedro, Cal.—The question of issuing $40,000 bonds for a light and water plant is being considered.

Goshen, Ind.—This city has advertised for 3 miles of water mains. the extension to cross Elkhart river.

Sandwich, Ont., Canada.—The question of providing $1,500 for water main extension will be voted on in January.

Mobile, Ala.—The bills providing for water works and sewerage systems for this city have been filed by Gov. Johnston.

Racine, Wis.—The question of putting in a pump to increase the water pressure at fires is being considered.

Fargo, N. D.—A preliminary estimate of the cost of new boilers for the pumpipng station is $2,300. Cy. Engr.

Taunton, Mass.—An order, appropriating

$15,000 for general construction work of the water works, has been adopted.

Colton, Cal.—This town has voted to issue $200,000 bonds for improving the water system by adding pumps and large mains.

Vineland, N. J.—A petition is being circulated asking that the borough be bonded for water works and electric lights.

Waco, Tex.—A site has been secured in East Waco for the establishment of a new system of artesian wells for a water supply.

Harrisburg, Pa.—The question of purchasing new pumping engines will be voted on in February. E. Mather, prest. water comrs.

Philadelphia, Pa.—A water filtration ordinance will be submitted to the council's water committee by Thos. M. Thompson, director of public works.

Chattanooga, Tenn.—The city engineer has been directed to furnish an estimate for the cost of building and operating a new water works system.

Washington, Ga.—A bill has passed the house authorizing the council of this town to issue bonds for water works, electric lights, etc.

Binghamton, N. Y.—About 12,600 ft. of flexible joint pipe and 2,500 ft. of common pipe will be purchased. John Anderson, secy. bd. water comrs.

Omaha, Neb.—The Omaha Water company contemplates a number of extensions to the water works system during the next season; estimated cost, about $100,000.

Lisbon, O.—A report has been submitted by E. C. Cooke of Cleveland on the proposed water works improvements. A filter is proposed, at a cost of $12,000.

Harrisburg, Pa.—The question of issuing $75,000 bonds for new engines at the pumping house will be voted on in February. J. D. Peterson, mayor.

Grand Haven, Mich.—The board of public works has recommended the purchase of new boilers for the water works and electric light plant; estimated cost, $3,000.

Brazil, Ind.—Action will be taken at once by the town council to determine the cost of piping water to this city from the Wabash river, a distance of 9 miles.

Far Rockaway, N. Y.—The purchase of new pumping engines of greater capacity is contemplated. Chas. R. Better, ch. engr. and Supt. Queens Co. Water Co.

Council Bluffs, Ia.—The Rock Island, U. P., K. C., St. J. & C. B. and Milwaukee railroads contemplate putting in an extensive pumping plant to furnish them the necessary water.

Cornwall, Ont., Canada.—The question of raising money for the purpose of developing the water power necessary to operate the water works of the town will be voted on Jan. 2.

St. Paul, Minn.—The Northern Pacific Ry. is reported as preparing to maintain water systems at many of the smaller towns along its line and will make a proposition to furnish the towns with water and light.

Tacoma, Wash.—The improvement and increase of the water supply is contemplated. The construction of about five miles of flume or stave pipe, at an estimated cost of $75,000, is the means proposed.

Birmingham, Ala.—(Special.)—Alber & Byrne, engrs., city, have been engaged to prepare plans and specifications and superintend the construction of the proposed water works and electric light plant. Contracts will be let about Feb. 1.

West Bay City, Mich.—It is proposed to secure experts to make complete plans and specifications for a water works system. Some competitive plan providing for awarding a premium may be adopted for the most satisfactory plans.

Lestershire, N. Y.—Arrangements are being made for the purchase of two triplex pumps of a minimum capacity of 350 gals. per minute, a smaller triplex pump with a minimum capacity of 60 gals. per minute, two gasoline engines and piping. Messrs. Faatz & Allen, water comrs.

The construction of water works systems is contemplated at the following places: Lawrenceburg, Ind.; Granville, Mass.; Nevada City, Cal.; Allison, Ia.; Enid, Ok. T.; Howard, S. D.; Canonsburg, Pa.; Frankton, Ind.; Lakefield, Minn.; Hartford, Mich.; Prairie Depot, O.; Brownstown, Ind.; Sibley, Ia.

CONTRACTS TO BE LET.

Oshawa, Ont.—Bids are asked until Jan. 4 for water works and sewers. C. French, chrmn. fire and w. w. com.

Gaffney, S. C.—Bids will be received until Jan. 3 for constructing a water works system. A. N. Wood.

Columbus, O.—Bids will be asked early in January for the construction of the new storage reservoir. Dir. Jacoos.

Winchester, Ind.—Bids are asked until Jan. 18 for the construction of a water works system, with sufficient buildings and power to add electric light. S. D. Fox, cy. clk.

Millvale, Pa.—Bids will be received until Jan. 3 for a vertical pump of 2,000,000 gals. capacity. The bids received Dec. 16 were all rejected. C. W. Dankmyer, cy clk.

McLeansboro, Ill.—New bids will be received about the middle of January for completing the municipal water works system. The bids received Dec. 10 have been rejected.

Norfolk, Va.—Bids are asked until Jan. 5 for the construction of a pumping station at Moore's Bridge and of a building, flume, drains and foundations for a mechanical filter plant. Bd. water comrs.

CONTRACTS AWARDED.

McKinney, Tex.—The contract for a water works system was awarded Dec. 13 to Kelly & Steele for $26,000.

Dunkirk, N. Y.—Bids were received until Dec. 20 for horizontal and vertical engines, but the contract has not yet been awarded.

West Tampa, Fla.—The contract for a water works system was awarded Dec. 8 to Guild & Co. of Chattanooga, Tenn., for $35,000.

Ft. Wayne, Ind.—The contract for furnishing a 6,000,000 gal. pumping engine has been awarded to the Holly Mfg. Co., Lockport, N. Y., for $20,500.

Allegheny, Pa.—The contract for furnishing a new 250-H. P. boiler and a stoker for the Howard-st. pumping station has been awarded to Wm. F. Patterson of Erie for $5,298.

Jersey City, N. J.—The contract for a new water supply was awarded Dec. 8 to Patrick H. Flynn of Brooklyn, the price to be $7,595,000, if the city announces its intention to purchase within a year from date of

contract. This is for plan No. 1, the supply to be taken from the Rockaway watershed.

Orange, N. J.—Bids were received for a pumping station, dam, etc., at Campbell's Pond, as follows: Borough Construction company of New York City, $50,000; Col. Daniel F. Minihan, Orange, $66,666.66.

Oil City, Pa.—Bids have been received for furnishing a 3,300,000 gal. vertical cross compound pumping engine from the Barr Pumping Engine company, Philadelphia; Snow Steam Pump Works, Buffalo, N. Y.; Loretz & Co., New York City.

BRIDGES.

Watertown, N. Y.—A new bridge at Court-st. has been recommended. Cy. clk.

St. Paul, Minn.—This city contemplates rebuilding the Sixth-st. bridge.

Arcadia, Wis.—This city has voted to construct a steel bridge across the Trempeleau river.

Norristown, Pa.—Plans for a sixty-foot, three-span iron bridge have been prepared by Edwin M. Richie, so surv.

Trent, S. D.—Bids will be received until Jan. 4 for replacing the Trent bridge. H. W. B. Souther, co. audt.

Harrison, O.—The construction of a new county bridge betwen Hamilton county, Ohio, and Dearborn county, Indiana, is contemplated.

New Haven, Conn.—Bids will probably be asked in January for a new iron bridge over West river at Derby-ave. Com. coun.

St. Thomas, Ont.—Bids are asked until Jan. 24 for building two iron bridges across Kettle creek. Jas. A. Bell, cy. engr.

Somerville, Mass.—The construction of a bridge over the Mystic river, between Somerville and Medford, has been petitioned.

Foosland, Ill.—The commissioners of Brown and Bellflower twps. contemplate building an iron bridge between the two townships.

Tarentum, Pa.—Petitions are being circulated for a joint county bridge across the Allegheny river, between New Kensington and this place.

Denison, Ia.—Bids will be received until Jan. 4 for constructing and repairing bridges for the ensuing year. J. T. Carey, co. audt.

Cleveland, O.—Bids will be received until Jan. 19 for building the superstructure of the Center-st. bridge. Geo. R. Warden, dir. pub. wks.

Brewton, Ala.—A bill is before the legislature authorizing the county to issue $25,000 in bonds to build a bridge across the Conecuh river.

Hastings, Neb.—Bids will be received Jan. 10 for building bridges for Adams co. during the year 1899. D. R. Bigelow, clk. bd. suprs.

Maquoketa, Ia.—The construction of a 200-ft. iron bridge in Monmouth twp. is contemplated at an estimated cost of $3,500. Fred Fischer, co. audt.

Schenectady, N. Y.—Plans have been prepared for a viaduct across the lands of Vale cemetery; estimated cost between $30,000 and $40,000.

Grand Island, Neb.—The county supervisors will consider the question of building a bridge across the Platte river at their January meeting.

Kansas City, Mo.—City Engineer Wise has been ordered to prepare plans and specifications for a steel bridge across the Belt line tracks on Kansas-ave.

Ballston Spa, N. Y.—A bill has been introduced in the board of county supervisors to authorize the town of Rossie to borrow $4,800 for the construction of an iron bridge.

Detroit, Mich.—The board of water commissioners contemplate replacing several of the 30 to 40 feet wooden bridges in the Water Works park with permanent structures.

Owego, N. Y.—The town board will probably let a contract early in the spring for an iron bridge across Owego creek; estimated cost, $10,000.

Victoria, B. C.—An estimate of the cost of constructing a bridge across James bay flats has been prepared by E. A. Wilmot, cy. engr.; estimated cost, $110,000.

Canton, O.—The council will consider the question of building a viaduct from near Newton-st. to Hazlett-ave. Thos. J. Bidwell, twp. trustee.

Saginaw, Mich.—The street railway company contemplates the erection of an iron bridge across the river at Bristol-st., to replace the present wooden structure.

Jackson, Miss.—The city will issue $20,000 in bonds Jan. 1 for a two-span Melan arch bridge, and some smaller girder bridges. Walter J. Kirkpatrick, cy. engr.

Milwaukee, Wis.—Plans were submitted to the council Dec. 5 for the construction of a viaduct over Kinnikinnic-ave., between Maple and Beecher-sts. G. H. Benzenberg, cy. engr.

Herkimer, N. Y.—The board of supervisors has been petitioned, according to press reports, for permission to build a bridge across West Canada creek; estimated cost, $13,500.

Watertown, N. Y.—The board of public works is considering the question of replacing the old bridge at Court-st. The city engineer will correspond with several bridge companies.

Plymouth, Mass.—The question of replacing certain bridges, destroyed by storms, is being considered by the board of selectmen. Plans for a new iron bridge over Eel river, on Warren-ave., have been prepared by Ernest Nickerson.

Washington, D. C.—The question of constructing a memorial bridge across the Potomac river, to connect West Washington with the government reservation at Arlington, Va., is being considered by the committee on interstate and foreign commerce; estimated cost, $1,250,000.

Boston, Mass.—The street commissioners gave a hearing Dec. 8 on the question of extending Atlantic-ave. to Dorchester-ave., South Boston, by building a bridge over the tracks of the Terminal company and over Ft. Point channel. It is proposed to give two other hearings.

Binghamton, N. Y.—Sealed competitive plans and estimates will be received until Jan. 17 for a wagon bridge across the Susquehanna river at Tompkins-st. The sum of $200 will be given the person submitting the plans selected, providing the person submitting the plans does not secure the contract for constructing the bridge. Burr W. Mosher, cy. clk.

PARKS.

Calnesville, Mo.—Bonds have been voted for the establishment of a park.

Anderson, Ind.—The press of this city urges the council to formulate a park system.

Joliet, Ill.—The city council has purchased eighty acres of land for park sites, and will make extensive improvements.

Jersey City, N. J.—A resolution was sent to the board of finance Dec. 21 requesting an appropriation of $100,000 for the acquisition of a park site in the Lafayette section of the city. St. and Water Bd.

Philadelphia, Pa.—Bids are asked until Jan. 14 for furnishing plans and for the development of League Island Park, comprising about 300 acres. Prizes of $750 and $250 will be awarded for the two best designs. A. S. Eisenhower, chrmn, bureau city property, 130 City Hall.

Utica, N. Y.—The public improvement committee favors bonding the city for $320,000 for the purpose of acquiring and improving for park purposes about 30 acres of land in West Utica, 400 acres on the southern border of the city and 30 acres in East Utica.

GARBAGE DISPOSAL AND STREET CLEANING.

Wheeling, W. Va.—The council health committee is considering the various methods of garbage disposal.

New York City.—The contract for the removal of snow and ice has been awarded to Bart Dunn at 30 cts. a cu. yd.

Chicago, Ill.—Bids will be asked for the removal and reduction of garbage. L. E. McGann, comr. pub. wks.

Atlantic City, N. J.—Bids will be asked for removing garbage for 1, 2 or 3 yrs. from Jan. 9, 1899. Cy. Clk. Irelan.

New York City.—The sum of $100,000 for a new plant for the street cleaning department is included in the budget for 1899.

St. Joseph, Mo.—Information, estimates, etc., for the disposal of the city's garbage is being secured by City Physician Graham.

Milwaukee, Wis.—A decision has been rendered by Judge Sutherland in favor of the construction of the proposed crematory by the Engel Sanitary Crematory company.

Passaic, N. J.—The question of securing better arrangements for the disposal of garbage of this city is urged by Dr. A. Warde Van Riper, prest. bd. of health.

Covington, Ky.—The contract for removing the garbage and ashes in both districts of the city for one year has been awarded to Gerhard Exterkamp at $361 per month.

Atlanta, Ga.—A bill has been introduced in the legislature amending the charter of this city to provide for the construction of a crematory in the center of the city.

Orange, N. J.—A scheme to build a union garbage disposal crematory, which will be centrally located, is proposed by the six municipalities—Orange, East Orange, West Orange, Montclair, Glen Ridge and Bloomfield.

Louisville, Ky.—A report on garbage crematories has been submitted by Dr. M. K. Allen, health officer, who recommends the appointment of a committee to consider the question of a plant for this city.

San Francisco, Cal.—The Garbage Sanitary Cremation company has been incorporated by Adolph Ramish and Martin C. Marsh of Los Angeles, and Chas. L. Asher, John Malonansky and Jacob Shaen of this city. The contract with the Sanitary Reduction company, which provided that the city should pay the operating expenses and a reasonable profit to the company, has been canceled by the supervisors.

Indianapolis, Ind.—Bids are asked, until Jan. 15, for cleaning the streets for 1899. The specifications call for two sets of bids. Bid A calls for the work as done last year, keeping an area of 10,000 sq. ft. clean for the whole year. Bid B calls for an estimate for cleaning the streets of the whole city and calls for machine sweeping from Jan. 1 to March 15, 1899, and from Dec. 15, 1899, to Jan. 1, 1900. M. A. Downing, chrm., B. P. W.

STREET LIGHTING.

Union Mills, Ind.—The installation of an electric light plant is contemplated.

Acton, Ont.—The sum of $6,000 has been voted for an electric light plant.

Fresno, Cal.—The city trustees decided Dec. 6 to ask for bids for street lighting.

Dalton, Ga.—The citizens voted Dec. 10 to issue $7,000 electric light bonds.

Loudonville, O.—Arrangements are being made to construct a new electric light plant.

Hartford City, Ind.—Municipal ownership of the electric light plant is proposed.

Savage, Md.—The county commissioners have decided to light this village by electricity.

Perkasie, Pa.—This town desires information regarding an electric light plant. E. F. Groff, clk.

Sturgis, Wash.—Bids will be received until Jan. 9 for an electric light plant. Chas. L. Hauer, supt.

Hastings, Neb.—Press reports state that the establishment of another electric light plant is proposed.

Centralia, Ill.—The city council will ask for bids for lighting the city with about 52 arc lights of 2,000 c. p.

Charlotte, Mich.—Another election will be held soon to vote on the question of building a municipal street light plant.

West Concord, Minn.—E. H. Van Ornum is reported as interested in the proposed construction of an electric light plant.

Maysville, Mo.—The question of acquiring a municipal plant or of letting the contract for electric lighting is being considered.

Marshalltown, Ia.—A committee has been appointed to consider the question of putting in a lighting plant. F. G. Pierce, mayor.

Rockford, O.—The establishment of an electric light plant is contemplated by an incorporated company of citizens. A. G. Stewart, mayor.

Monroe, Wis.—An ordinance has been introduced in the council for the construction and maintenance of a gas plant; estimated cost, $21,000.

Columbus, Wis.—A committee has been appointed to investigate the advisability of putting in an electric light plant. Mayor W. C. Leitsch.

Indianapolis, Ind.—Only one bid was received Dec. 28 for lighting the streets with vapor light, that of the Sun Vapor Light Co., Canton, O., which bid $16.25 on a moonlight schedule and $18 for all night.

(Continued on page 32.)

Vol.